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ABSTRACT

This document consists of the papers presented at a meeting of experts who examined and evaluated systems analysis and management technique applications to practical educational planning. The papers focus primarily on the integration of shortrun and longrun aspects of educational planning and the relationship between objectives and implementation. Within this context, the role of the budgeting procedure is examined with a view to introducing possible improvements in current budgeting practice through use of more program and multiyear budgets. Also considered are the uses of management techniques such as cost-effectiveness analysis in program planning and in resource allocations studies. (Author/RA)

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budgeting, programme analysis and cost-effectiveness in educational planning

la programmation budgétaire et l'analyse coût-efficacité dans la planification de l'enseignement

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
ORGANISATION DE COOPÉRATION ET DE DÉVELOPPEMENT ÉCONOMIQUES

Paris 1968

The Organisation for Economic Co-operation and Development was set up under a Convention signed in Paris on 14th December 1960 by the Member countries of the Organisation for European Economic Co-operation and by Canada and the United States. This Convention provides that the O.E.C.D. shall promote policies designed:

- *to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the world economy;*
- *to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development;*
- *to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.*

The legal personality possessed by the Organisation for European Economic Co-operation continues in the O.E.C.D. which came into being on 30th September 1961.

The members of O.E.C.D. are Austria, Belgium, Canada, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

L'Organisation de Coopération et de Développement Économiques a été instituée par une Convention signée le 14 décembre 1960 à Paris, par les membres de l'Organisation Européenne de Coopération Économique, ainsi que par le Canada et les États-Unis. Aux termes de cette Convention, l'O.C.D.E. a pour objectif de promouvoir des politiques visant :

- *à réaliser la plus forte expansion possible de l'économie et de l'emploi et une progression du niveau de vie dans les pays Membres, tout en maintenant la stabilité financière, et contribuer ainsi au développement de l'économie mondiale ;*
- *à contribuer à une saine expansion économique dans les pays Membres, ainsi que non membres, en voie de développement économique ;*
- *à contribuer à l'expansion du commerce mondial sur une base multilatérale et non discriminatoire, conformément aux obligations internationales.*

La personnalité juridique que possédait l'Organisation Européenne de Coopération Économique se continue dans l'O.C.D.E., dont la création a pris effet le 30 septembre 1961.

Les membres de l'O.C.D.E. sont : la République fédérale d'Allemagne, l'Autriche, la Belgique, le Canada, le Danemark, l'Espagne, les États-Unis, la France, la Grèce, l'Irlande, l'Islande, l'Italie, le Japon, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni, la Suède, la Suisse et la Turquie.

PREFACE

The O.E.C.D. Committee for Scientific and Technical Personnel, which is the intergovernmental body responsible for the activities of the Organisation in education, has embarked upon an experimental programme to examine and evaluate applications of systems analysis and management techniques to practical educational planning.

As part of this programme a series of ad hoc meetings of experts has been arranged to bring together the most recent information available in Member countries on specific issues in this area. The present volume contains the papers presented at the meeting on "Budgeting, Programme Analysis and Cost-Effectiveness in Educational Planning" held in April, 1968. In addition, an introductory summary has been included as well as the presentations, given at the meeting, of present programme budgeting applications in Canada and Sweden, together with a summary by Professor Vaizey of his impressions of the meeting.

The meeting focused primarily on the integration of short-run and long-run aspects of educational planning and the relationship between objectives and implementation. In this context the role of the budgeting procedure was particularly examined. The papers and discussions dealt with various possible improvements to current budgeting procedures, such as the introduction of more programme or function oriented budget structures and the use of some form of multi-year budgets as a supplement to the annual budget. A number of resource implication models were also presented at the meeting. Such models, which seem to be in a fairly advanced stage of development, can be useful both for policy evaluation purposes and for the establishment of multi-year programme budgets.

The meeting also considered the use of such management techniques as cost-benefit and cost-effectiveness analysis in programme planning and in resource allocation studies. Though the usefulness of these techniques depends to a large extent on the nature of the problem under consideration and on the availability of data, it was felt, nonetheless, that their application is already making an important contribution by helping clarify educational objectives.

PRÉFACE

Le Comité du Personnel Scientifique et Technique de l'OCDE, organe intergouvernemental responsable des activités de l'Organisation en matière d'éducation, a mis en oeuvre un programme expérimental afin d'étudier et d'évaluer l'application pratique des techniques modernes d'analyse et de gestion aux problèmes de la planification de l'enseignement.

Dans le cadre de ce programme, le Comité a organisé une série de réunions d'experts, dans le but de rassembler les informations les plus récentes concernant certains aspects des résultats obtenus dans différents pays-Membres. Le présent rapport rend compte des communications présentées lors de la réunion d'avril 1968 consacrée à "la Programmation budgétaire et l'Analyse coût-efficacité dans la Planification de l'enseignement". Ce compte-rendu est accompagné d'une note liminaire résumant les différents documents présentés, de deux présentations d'applications actuelles de programmation budgétaire au Canada et en Suède, et d'un exposé du Professeur Vaizey qui résume les débats et en tire un certain nombre de conclusions.

La coordination des aspects à court et moyen terme de la planification et les rapports qui existent entre les objectifs et les moyens mis en oeuvre pour les atteindre ont fourni le thème principal de la réunion. Dans ce contexte, le rôle de la procédure budgétaire a fait l'objet d'un examen plus particulier. Les communications et les discussions ont porté sur les différents moyens de perfectionner les procédures actuelles, tels l'introduction de budgets structurés selon des programmes et l'utilisation de budgets couvrant plusieurs années en complément du budget annuel. Un certain nombre de modèles de ressources ont été également présentés. Ces modèles qui semblent avoir atteint un stade d'évolution relativement avancé, peuvent être utilisés à la fois à des fins d'évaluation des politiques et pour la programmation budgétaire sur une base de plusieurs années.

Les participants ont également examiné l'utilisation de techniques de gestion telles que l'analyse coût-bénéfice et coût-efficacité pour la planification par programmes et pour les études d'allocation des ressources. L'efficacité de ces techniques dépend, dans une large mesure, de la nature des problèmes et des données disponibles. Mais il semble que d'ores et déjà, leur application contribue à mieux préciser les objectifs de l'enseignement.

CONTENTS

PART I

Summary Record of the Meeting by the Secretariat 1
Compte rendu de la réunion par le Secrétariat 7

A Personal Impression, by J. Vaizey 13
Impressions sur la réunion, par J. Vaizey 19

Introduction to Programme Budgeting and Cost-Effectiveness Analysis in Educational Planning, by B. Schwarz 26
Introduction à la programmation budgétaire et à l'analyse coût-efficacité dans la planification de l'enseignement, par B. Schwarz 56

PART II

The Budget as an Instrument for Medium and Long-Range Planning and Programming of Education, by W.Z. Hirsch 92
Le budget: outil de planification et de programmation de l'enseignement à moyen et à long terme, par W.Z. Hirsch (Résumé) 107

Program Budgeting and Cost-Effectiveness in Local Schools, by H.J. Hartley 111
Programmation budgétaire et coût-efficacité dans les institutions régionales, par H.J. Hartley (Résumé) 128

Problems in the Drawing up of a Three-Year Education Budget, by L. Dahlgaard 133
Problemes liés à l'établissement d'un budget triennal, par L. Dahlgaard (Résumé) 142

Some Financial Instruments and Efficiency Incentives in Educational Policy, by K. Eide 146
Les stimulants économiques et les instruments financiers efficaces pour une politique de l'enseignement, par K. Eide (Résumé) 169

Cost-Benefit and Cost-Effectiveness Analyses of Education, by M. Blaug 173
Analyses coût-bénéfice et coût-efficacité appliquées à l'enseignement, par M. Blaug 185

Allocation of Resources to Education - Towards a Theory of Subsidy, by J. Froomkin 201
Allocation des ressources dans l'enseignement : vers une théorie des subventions, par J. Froomkin (Résumé) 222

The Role of Cost Models in Educational Planning - The Case of the Federal Republic of Germany, by K. Hüfner and E. Schmitz 225
Le rôle des modèles de coûts dans la planification de l'enseignement - le cas de la République fédérale d' Allemagne, par K. Hüfner et E. Schmitz (Résumé) 248

Systems Analysis of Alternative Designs of a Faculty, by R. Judy, J. Levine, R. Wilson and J. Walter 252
Application de l'analyse des systèmes à l'appréciation de différents projets de faculté, par R. Judy, J. Levine, R. Wilson et J. Walter (Résumé) 287

Programme Budgeting in Sweden, by C-F. Hammar 291
Programme Budgeting in Canada, by R.H. Marshall 195

List of Participants (Liste des Participants) 299

PART I

SUMMARY RECORD OF THE MEETING

by the Secretariat

The meeting examined the role of the budgeting procedure in the co-ordination of long-term and short-term educational planning and the present stage of development as to the application of various analytical approaches such as cost-effectiveness and cost-benefit analysis to educational planning problems. In addition to a number of specialists who contributed papers, the meeting was also attended by representatives from most Member countries nominated by their national administrations. An opportunity was thus provided for specialists in the field to discuss their work among themselves and for a dialogue between technical specialists and educational planners and administrators. Some of the main points of the papers and of the issues raised during the discussion are outlined below.

Many educational problems have by necessity to be viewed over a long time horizon. Not only do decisions concerning educational expansion and change take time to implement, but there is also often a long lead-time before a change in the educational system exerts its full influence on economic and social conditions.

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(1) The present volume was prepared for publication by B. Schwarz who, as consultant to the Directorate for Scientific Affairs, carried main responsibility in the organisation of the meeting.

In resource allocation studies the term programme (2) is frequently used as a notation for a function or end-objective oriented category. A programme might, for example, consist of primary education or of a one-year prolongation of compulsory schooling or science education in secondary schools. The programme concept seems to be important for the entire planning process, i.e. for analytical work in connection with the establishment of long-range plans as well as for budgeting and implementation.

Programme budgeting in its narrower sense means a partition of the activities considered in "programmes" and a presentation of their costs in accordance with these programmes. A programme budget is usually taken to mean a multi-year budget with a programme structure. Various aspects of such programme structures or formats are presented in Professor Hirsch's paper on "The Budget as an Instrument for Medium and Long-Range Planning and Programming of Education" and in Professor Hartley's paper on "Programme Budgeting and Cost-Effectiveness in Local Schools". The former paper also gives an illustration of a multi-year programme budget projection model for the University of California which forecasts future resource needs for a 10-year period. Professor Hartley presented examples of programme budgeting arrangements in local schools. He also discussed the use of performance indicators which eventually may be used in cost-effectiveness analysis and concluded with an outline of present limitations of the systems approach in local schools.

An account of the introduction of a rolling multi-year budget is given in Mr. Dahlgaard's paper, "Problems in the Drawing up of a Three-Year Budget". It illustrated how the establishment of multi-year budgets can help to draw attention to specific planning problems, such as imbalances between teacher supply and demand. Different alternatives for dealing with such problems can then be further examined.

Professor Hirsch outlines in his paper the scope of planning as an activity intended "to assist in the development of information and guide-lines to such educational questions as what programmes should be developed, how should funds be allocated between programmes, are programmes consistent with each other, what goals and objectives should officials seek to achieve through their programmes, who should benefit from and who should pay for education, how many students should be educated by how many teachers and support personnel, with what background and training and in what facilities and where?". He points out that for planning to be capable of implementation, the planning process must not end with the preparation of a set of recommendations or plans prepared in isolation from the programmes through which they must be implemented. The mechanism for implementation includes the preparation of programmes in physical and financial terms which ultimately are set forth in the budget.

There was at the meeting a discussion of the interpretation of the programme budgeting concept. It appears that programme budgeting in some countries is primarily used in its narrower sense, i.e. it includes only the establishment of one-year or multi-year budgets with a programme oriented structure. Most participants, however, used programme budgeting in a broader sense covering an entire long-range planning process which, as well as budgeting, involves programme analysis, various analytical studies, and the establishment of a number of planning documents presenting more complex and complete information than what can be contained in a budgetary document. To avoid terminological confusion this note uses the term "programme planning" for this wider concept.

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(2) Explanation of terms and a general overview of the theme of the meeting is provided in the paper "Introduction to Programme Budgeting and Cost-Effectiveness Analysis in Educational Planning".

There seemed to be general agreement at the meeting that the budget structure had, to some extent, become obsolete in a number of countries and that improvements could be made so as to make the budget present information which is more in accordance with the present view of the educational system and its objectives. Furthermore, multi-year budgets would facilitate the coordination of planning and budgeting. In this context, the question arose as to what extent the budget represents a commitment on the part of the authorities. For one-year budgets it does undoubtedly represent such a commitment. For multi-year budgets it would be useful to distinguish between that part of the expenditures which is committed and that which remains open for subsequent reallocation considerations.

With regard to the need for budgetary reforms, it was suggested that, although such reforms are important, they should not be given too much emphasis in relation to the efforts which must be made towards systematic planning and programme analysis. Even improved budgetary documents can contain only a small part of the information necessary for planning decisions. This is due, among other things, to the fact that a partition of costs according to end-objective related programmes can never be quite consistent as there will always be some overlapping between the programmes.

One of the advantages of the programme concept is the possibility of using it as a basis for more consistent decentralisation and for the creation of incentives for efficiency. Mr. Eide, in his paper, outlines the present Norwegian system for the financing of education and the partition of decision-making responsibilities between the national and the local governments. He examined different kinds of policy instruments which he groups under three headings: (a) legal instruments, (b) financial instruments and (c) informative instruments. Financial instruments can be made more flexible than legal instruments, as they can influence the behaviour of the individuals without reducing their freedom of action to the same extent. At present, governmental subsidies in Norway are tied to only a part of the educational expenditure of local authorities (teachers' salaries), that is, they are object instead of programme oriented. The paper suggests that the use of total current expenditure, estimated by "standard costs", forms a better basis for subsidies and outlines how such a method creates incentives for better resource allocation.

As to the analytical aspects of programme planning, there are a number of terms in current use such as systems analysis, cost-effectiveness analysis and cost-benefit analysis. These methods or approaches are, of course, also used without direct connection with programme planning, but they always involve some kind of programme or system concept.

As pointed out in Professor Blaug's paper on "Cost-Benefit and Cost-Effectiveness Analyses of Education", the term cost benefit analysis is mostly employed when the "benefit" of a project can be measured in units directly comparable to its costs, that is, generally in monetary units. In this case the benefit/cost ratio or a rate of return is calculated to give a basis for decisions concerning the profitability of the project. When the benefit of a project or programme cannot be calculated or estimated in monetary units, which is often the case for governmental activities, another approach is to define some measure of effectiveness or utility which is related to the objective of the activity in question.

Cost-benefit analysis of education generally takes the form of calculating an "internal rate of return" on investment in education, that is to say, discovering the discount rate which equates the present value of extra lifetime earnings attributable to a certain amount of some type of additional education (after the legal school-leaving age) with the present value of the costs of that extra education. By "costs" are meant not only directly school-related costs (teachers' salaries, buildings, books etc.) but also the earnings foregone by students from being at school rather than at work. When the costs are confined to the costs paid by the student himself and earnings foregone and when the earnings attributable to education are taken after tax, one speaks of "the private rate of return"; when all resources are taken into account and earnings are taken before tax, one speaks of "the social rate of return".

Professor Blaug gives an account of the role of cost-benefit analysis in education, its virtues and limitations and the need for supplementing it with cost-effectiveness analyses because of the multi-objective nature of the educational system, each objective requiring separate cost-effectiveness analyses. While the use of the social rate of return in education is a very complex and somewhat controversial problem, estimates of the private rate of return should be more directly useful as it is one of the important factors influencing the social demand for education. The view was expressed during the discussion that the lack of interest in European countries in the collection of data required for calculations of the private rate of return was somewhat surprising.

A new application of calculations of the private rate of return is suggested in Dr. Froomkin's paper on "Allocation of Resources to Education: Towards a Theory of Subsidy", where he suggests that governmental subsidies to students should be used to reduce income disparities. However, to reach this effect investments in education must first produce a monotonically downward slope in internal rates of return for each additional increment in educational attainment. If educational subsidies to a given level of students, say college students, are increased in order to equalise educational opportunities, but the number of spaces for college entrants remains constant, it is quite possible that higher educational institutions will become more selective, and only admit the most gifted students. Under those circumstances, the concentration of incomes is likely to increase rather than decrease. A conclusion from Dr. Froomkin's paper seems to be that in countries where equal educational opportunity as well as redistribution of income are important educational objectives, proposed subsidy policies have to be closely examined as to their effect on both these objectives.

Cost-effectiveness analysis in long-range planning requires an estimate of the full cost implications of the programme considered. Cost or resource models therefore have to be worked out. Illustrations of such cost models and various aspects of their role in planning and budgeting are given in the paper by Professor Judy and his colleagues on "Systems Analysis of Alternative Designs of a Faculty" and in "The Role of Cost Models in Educational Planning: The Case of the Federal Republic of Germany", by E. Schmitz and K. Hüfner. The former paper illustrates how systems analysis can aid university planning by means of a case study of a specific university planning situation and indicates some of the problems of carrying out such analysis and implementing its results. For this study, a computerized resource implication model has been developed which accepts technological descriptions of the system and output levels (curricula, enrollments etc.) and computes the quantities of inputs "required" to produce the outputs. Applied to the Faculty of Medicine, the inputs currently being calculated directly by the simulation programmes consist of staff and space requirements and number of patients and quantity of supplies. The cost model of the Federal Republic of Germany is somewhat more aggregated and calculates future budgeting implications of demographic changes, various student/teacher ratios, etc.

When comparing different alternatives with the aid of cost implication models there are different methods for evaluating the results. Either different alternatives having the same cost can be compared and the one having the "highest effectiveness", that is, best accomplishing the objective in question, is chosen; or a certain objective or output is fixed and the cost is minimized. This rather obvious procedure cannot always be followed in practice because, among other things, measures of effectiveness cannot always be directly estimated. Some other possibilities were discussed during the meeting. In Denmark the cost implication of reducing the student/teacher ratio from 24 to 20 was estimated and found very high in comparison with the cost of increasing the length of compulsory schooling. Based on general value judgments, an increase of the compulsory school age was considered preferable and no explicit effectiveness calculations had to be carried out.

In this context, problems and pitfalls as to the choice of productivity and effectiveness measures were discussed at the meeting. In connection with programme budgeting the point was stressed that budgetary documents would provide more useful information if they included some measure of the output expected from the resources allocated. This output measure should not, however, be misinterpreted by being considered directly relevant for all resource allocation problems. For each planning problem a measure or measures of effectiveness have to be defined so as to be directly related to the objective(s) of the programme in question.

Conclusions

Though it is difficult to sum up the variety of views which were expressed in these discussions, the Secretariat feels that there was general consensus as to the following points which have a direct relevance to policy and decision-making:

(a) Programme planning can have an important role by helping clarify objectives and by providing a framework for studies of the consistency between educational policies and the accomplishment of educational objectives. Resource implication models can be useful tools for such studies.

(b) The need for coordination of long-range planning with decision-making, budgetary and implementation procedures does not imply a need for changing responsibilities. Educational planning activities should, however, be oriented towards the provision of information relevant to budgetary decisions. Budget structures and procedures on the other hand may need systematic and continuous revision to be in line with current policy objectives. This harmonisation of planning and budgetary functions does require careful analyses of goals, resources and policy instruments and their mutual interdependence. Developments in this direction would also facilitate more extensive application of such management techniques as cost-benefit analysis, cost-effectiveness analysis, the application of cost models, policy instrument analysis, etc.

(c) It is important to adopt a budgetary procedure that allows for periodic review of total programmes as opposed to annual budgeting procedures in which very large proportions of the expenditure are already committed.

(d) A number of models and formal budget structures exist for programme budgeting in education at various levels of administration, and attention should be given to the application of already existing knowledge and to the provision of some specialised training for people to be engaged in this field.

(e) Programme planning involves a number of aspects and approaches, none of which is entirely new. It might, however, indicate how certain gradual changes and the increased use of certain techniques can be of practical value in educational planning and policy making.

COMPTE RENDU DE LA RÉUNION

par le Secrétariat

La réunion a étudié le rôle du processus budgétaire dans la coordination de la planification à long terme avec celle à court terme, et l'état présent du développement des applications aux problèmes de planification de l'enseignement des différentes approches analytiques telles que les analyses coût-efficacité et coût-bénéfice. En plus d'un certain nombre de spécialistes ayant soumis des études, la réunion a aussi accueilli des représentants de la plupart des pays membres, nommés par leurs administrations nationales. Une occasion était ainsi créée pour que les experts en la matière discutent de leurs travaux et pour que s'établisse un dialogue entre les experts techniques et les experts administratifs de la planification de l'enseignement. Quelques points importants relatifs aux différentes études et aux problèmes soulevés durant la discussion sont présentés ci-dessous.

Parmi les problèmes concernant l'enseignement, beaucoup doivent nécessairement être considérés dans une optique lointaine. Il faut du temps, non seulement pour mettre en oeuvre les décisions prévoyant une expansion et des réformes en matière d'enseignement, mais aussi pour qu'une réforme de l'enseignement produise tous ses effets sur la collectivité dans les domaines économique et social.

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(1) Le présent document a été préparé, en vue de sa publication, par B. Schwarz, consultante à la Direction des Affaires Scientifiques, qui a pris la responsabilité de cette réunion au sein de l'Organisation.

Dans les études concernant la répartition des ressources, le terme de "programme"(1) est souvent utilisé pour désigner une fonction ou une catégorie orientée vers un objectif final. Ainsi, l'instruction primaire, la prolongation d'un an de la scolarité obligatoire ou l'enseignement des sciences dans les établissements secondaires peuvent constituter des programmes. Cette notion de programme joue un rôle important dans tout le processus de planification, qu'il s'agisse des études analytiques précédent l'établissement de plans à long terme ou de la programmation budgétaire et de sa mise en oeuvre.

Pour établir une programmation budgétaire, au sens étroit du terme, on divise les activités considérées en "programmes" et on établit en conséquence la présentation des dépenses correspondantes. Par budget par programme, on entend généralement un budget pluri-annuel structuré suivant les programmes. Divers aspects de ces structures ou formats de programme sont examinés dans le document de M. Hirsch intitulé : "Le budget : outil de planification et de programmation de l'enseignement à moyen et à long terme" et celui de M. Hartley qui est intitulé : "Programmation budgétaire et coût-efficacité dans les institutions régionales". M. Hirsch donne, à titre d'exemple, un modèle de projection d'un budget programmé pluri-annuel, établi pour l'Université de Californie, qui prévoit les besoins de ressources pour une période de 10 ans. M. Hartley donne des exemples de programmation budgétaire établie pour des écoles sur le plan local. Il étudie également l'utilisation des indicateurs d'efficacité et leur application éventuelle à l'analyse coût-efficacité ; pour terminer, il trace, dans leurs grandes lignes, les limites actuelles de l'analyse des systèmes appliquée à des écoles.

M. Dahlgaards, dans son document intitulé : "Problèmes liés à l'établissement d'un budget triennal" donne un exemple de budget pluri-annuel à horizon mouvant. Il montre comment l'établissement de budgets pluri-annuels permet d'attirer l'attention sur des problèmes spécifiques de planification tels que le déséquilibre entre l'offre et la demande de professeurs. Les diverses solutions peuvent alors être étudiées de plus près.

Dans sa communication, M. Hirsch définit la planification comme une activité qui doit aider à élaborer des informations et des principes directeurs sur des problèmes touchant l'enseignement : types de programmes à élaborer, répartition des fonds entre les programmes, compatibilité des programmes les uns avec les autres, objectifs que les experts administratifs doivent chercher à atteindre dans leurs programmes, bénéficiaires de l'enseignement et organismes qui doivent en supporter la charge, nombre d'étudiants auxquels l'enseignement doit être dispensé, effectif des professeurs et auxiliaires, leurs diplômes, et leur formation professionnelle, les installations nécessaires et leur point d'implantation. M. Hirsch remarque que, pour que les plans soient réalisables, il ne faut pas que le processus de planification prenne fin avec l'élaboration d'une série de recommandations ou de plans sans que des programmes d'exécution aient été prévus. Le mécanisme de mise en oeuvre comprend l'élaboration de programmes matériels et financiers, qui finalement sont incorporés dans le budget.

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(1) Le document présenté par B. Schwarz sous le titre "Introduction à la programmation budgétaire et à l'analyse coût-efficacité dans la planification de l'enseignement", donne l'explication des termes employés et contient une étude d'ensemble des thèmes traités au cours de la réunion.

Les participants ont examiné le sens du concept de programmation budgétaire. Il semble que dans certains pays, le terme de programmation budgétaire soit utilisé dans un sens étroit, pour désigner uniquement l'établissement de budgets annuels ou pluri-annuels structurés suivant les programmes. De nombreux participants ont cependant utilisé les termes de programmation budgétaire dans un sens plus large, couvrant tout un processus de planification à long terme qui, englobe, non seulement l'établissement de budgets, mais aussi l'analyse des programmes, diverses études analytiques et l'établissement d'un certain nombre de documents de planification où figurent des renseignements plus détaillés et plus complets que ne peut en contenir un document budgétaire. Pour éviter toute confusion terminologique, nous avons adopté dans cette note le terme de "planification par programmes" pour couvrir ce concept plus large.

Tout le monde semble s'être accordé à reconnaître au cours de la réunion que la structure budgétaire était quelque peu dépassée dans un certain nombre de pays et qu'il fallait y apporter des améliorations de façon que la structure du budget corresponde mieux à l'idée qu'on se fait actuellement du système d'enseignement et de ses objectifs. En outre, des budgets pluri-annuels faciliteraient la coordination des plans et des budgets. A ce propos, on peut se demander dans quelle mesure le budget représente un engagement de la part des autorités. Le budget annuel représente sans aucun doute un tel engagement. Pour le budget pluri-annuel, il conviendrait de distinguer la part des dépenses qui est déjà engagée de celle dont la répartition reste à fixer.

Quant aux réformes budgétaires, il a été reconnu que c'était un point important, mais qu'il ne devrait pas leur accorder une trop grande place au détriment des efforts tendant à rendre systématiques la planification et l'analyse de programmes. Même améliorés, les documents budgétaires ne peuvent contenir qu'une petite partie des renseignements nécessaires à la prise de décisions en matière de planification. Cela est dû, en particulier, au fait que l'attribution des coûts suivant les horizons de chaque programme n'est jamais totalement cohérente car il existe toujours des recouvrements entre certains programmes.

Un des avantages de cette notion de programme est qu'on peut en faire la base d'une décentralisation plus rationnelle et s'en servir pour créer des stimulants et améliorer ainsi l'efficacité des politiques. Dans son document, M. Eide expose les grandes lignes du système appliqué actuellement en Norvège pour le financement de l'enseignement et la répartition des pouvoirs de décision entre les autorités centrales et les autorités locales. Il examine differents instruments de politique, qu'il classe en trois groupes :

(1) les instruments de caractère juridique,
(2) les instruments financiers, et
(3) les instruments d'informations.

Les instruments financiers peuvent être d'une utilisation plus souple que les instruments de type juridique : ils influeront sur le comportement des individus, sans réduire pour autant leur liberté d'action. Actuellement, les subventions attribuées par l'Etat norvégien ne couvrent qu'une partie des dépenses d'enseignement des autorités locales (salaires des professeurs) ; autrement dit, elles sont orientées vers un objet et non vers un programme. M. Eide estime que le montant total des dépenses de fonctionnement, estimé au moyen de "coûts standard" offre une meilleure base au calcul des subventions et que cette méthode favorise une meilleure répartition des ressources.

A propos des aspects analytiques de la planification par programmes, on utilise couramment un certain nombre de termes comme l'analyse des systèmes, l'analyse coût-efficacité et l'analyse coût-bénéfice. Les méthodes ou démarches que ces expressions recouvrent, peuvent évidemment être utilisées en dehors de tout rapport direct avec la planification par programmes, mais elles reposent toujours sur un concept de programme ou de système.

Comme le fait remarquer M. Blaug dans son document : "Analyses coût-bénéfice et coût-efficacité appliquées à l'enseignement", le terme analyse coût-bénéfice est surtout employé lorsque le "bénéfice" d'un projet peut être mesuré en unités directement comparables à son coût, c'est-à-dire généralement en unités monétaires. Dans ce cas, on calcule, soit le rapport bénéfice-coût, soit un taux de rendement qui permet d'apprécier la rentabilité du projet. Lorsque le bénéfice d'un projet ou d'un programme ne peut être calculé ou estimé en unités monétaires, ce qui est souvent le cas pour les activités du secteur public, une autre méthode consiste à définir une mesure d'efficacité ou d'utilité, liée à l'objectif visé.

L'analyse coût-bénéfice appliquée à l'enseignement consiste généralement à calculer la "rentabilité interne" des sommes investies dans l'enseignement, autrement dit, à déterminer le taux d'actualisation qui permet d'égaler la valeur actuelle du supplément de gains qu'obtiendra durant son existence un individu ayant reçu un supplément d'instruction d'une certaine durée ou d'un certain type (au-delà de la scolarité obligatoire) à la valeur actuelle du coût de ce supplément d'instruction. Par "coût" on entend, non seulement les dépenses d'enseignement proprement dites (salaires des professeurs, bâtiments, livres, etc.), mais aussi les gains auxquels les étudiants ont renoncé en poursuivant leurs études au lieu de prendre un emploi rémunéré. Si par "coût" on entend seulement les dépenses et le manque à gagner des étudiants et si l'on considère les gains imputables à l'instruction reçue, nets d'impôts, on parle de "rentabilité privée" ; si l'on fait entrer en ligne de compte toutes les ressources affectées à l'enseignement et si l'on considère les gains bruts d'impôts, on parle alors de "rentabilité sociale".

M. Blaug décrit le rôle de l'analyse coût-bénéfice dans l'enseignement, ses avantages, ses limites et la nécessité de la compléter par des analyses coût-efficacité en raison de la multiplicité des objectifs de l'enseignement, chacun exigeant une analyse distincte coût-efficacité. Si l'utilisation d'un taux de rentabilité sociale dans l'enseignement est un problème très complexe et quelque peu controversé, le taux de rentabilité privée devrait trouver une utilisation plus directe, car c'est un des principaux facteurs qui agissent sur la demande sociale d'enseignement. Au cours des discussions, on s'est étonné du peu d'intérêt que rencontrait dans les pays européens la collecte des données nécessaires au calcul du taux de rentabilité privée.

M. Froomkin, dans son document : "Allocation des ressources dans l'enseignement : vers une théorie des subventions", indique une nouvelle application du calcul du taux de rentabilité privée ; il suggère que les subventions de l'Etat aux étudiants soient utilisées pour réduire les inégalités de revenus. Mais pour produire cet effet, les investissements dans l'enseignement doivent d'abord provoquer une diminution, suivant une courbe uniformément descendante, des taux de rentabilité interne pour tout supplément d'instruction reçue. Si les subventions à l'enseignement, à un niveau donné des étudiants, disons au niveau universitaire, sont augmentées pour égaliser les chances d'accès à l'enseignement, mais que l'espace disponible pour accueillir les nouveaux inscrits reste le même, les établissements d'enseignement supérieur peuvent fort bien pratiquer une sélection plus sévère et n'admettre que les étudiants les plus doués. Dans ces conditions, la concentration des revenus s'accentuera probablement, plutôt qu'elle ne diminuera. Une des conclusions qui ressort du document de M. Froomkin est que, dans les pays ou l'égalité d'accès à l'enseignement et la redistribution des revenus sont des objectifs scolaires importants, les politiques envisagées en matière de subvention doivent être soigneusement examinées du point de vue de leur effet sur ces deux objectifs.

Dans la planification à long terme, l'analyse coût-efficacité requiert une estimation de toutes les conséquences financières des programmes considérés. Il faut donc élaborer des modèles de coûts ou de ressources. Le document du groupe de Pr. Judy sur l'"Application de l'analyse des systèmes à l'appréciation de différents projets de faculté" et celui de MM. Schmitz et Hüfner sur "Le rôle des modèles de coûts dans la planification de l'enseignement - le cas de la République fédérale d'Allemagne" contiennent des exemples de modèles de coûts, avec un examen du rôle qu'ils jouent dans la planification et l'établissement des budgets. La première étude montre comment l'analyse des systèmes peut aider la planification au niveau de l'université, au moyen d'une étude de cas se rapportant à un problème de planification dans une université donnée. Les auteurs décrivent quelques-uns des problèmes qu'on rencontre dans une telle analyse et dans l'application de ses résultats. Pour cette étude, on a mis au point un modèle permettant de calculer les conséquences du projet en matière de ressources. On fait entrer dans ce modèle la description technologique du système et les niveaux de production à atteindre (output) (programmes, nouveaux inscrits, etc.) et calcule les quantités d'inputs "nécessaires" pour y parvenir. Ce modèle a été appliqué à une faculté de médecine. Dans ce cas les inputs que l'on calcule directement grâce aux programmes de simulation sont les suivants : personnel et espace nécessaires, nombre de malades, etc. Le modèle de coûts mis au point en République fédérale d'Allemagne se situe à un niveau d'agrégation plus élevé. Il permet de calculer l'incidence future de l'évolution démographique sur l'établissement des budgets, divers rapports élèves/professeur, etc.

Quand on compare les diverses solutions possibles au moyen de modèles de coûts, on peut utiliser diverses méthodes pour évaluer les résultats, soit que l'on compare les solutions correspondant à un même coût et qu'on choisisse la solution la plus efficace, c'est-à-dire celle qui permet le mieux de réaliser l'objectif considéré ; soit qu'on fixe un certain objectif ou output et qu'on en réduise le coût au minimum. Cette procédure, qui paraît assez simple, ne peut pas toujours être suivie dans la pratique, parce que, notamment l'efficacité ne peut pas toujours être directement mesurée. D'autres possibilités ont été examinées au cours de la réunion. Au Danemark, on a estimé les conséquences pour les coûts d'une réduction de 24 à 20 du rapport élèves/professeurs et on a constaté que les coûts obtenus étaient très élevés par rapport au coût de prolongation de la scolarité obligatoire. Partant de jugements de valeur de caractère général, on a estimé qu'il était préférable de prolonger la scolarité obligatoire et on n'a pas eu à effectuer de calcul explicite d'efficacité.

Dans le présent contexte, on a étudié les problèmes et difficultés que pose le choix des mesures de productivité et d'efficacité. A propos de la programmation budgétaire, on a souligné que les documents budgétaires seraient une source de renseignements plus utile s'ils comprenaient une mesure de la production qu'on espère tirer des ressources allouées. Cette mesure ne doit pas cependant être utilisée mal à propos en considérant qu'elle peut être appliquée directement à tous les problèmes d'affectation de ressources. Pour chaque problème de planification, il faut définir une (ou plusieurs) mesure (s) d'efficacité, qui soient directement liées à l'objectif (ou aux objectifs) du programme considéré.

Conclusions

Bien qu'il soit difficile de résumer les opinions très diverses exprimées au cours des discussions, le Secrétariat estime qu'il y a eu un accord général sur les points suivants, qui ont directement trait à la politique et à la prise des décisions :

(a) La planification par programmes peut jouer un rôle important en aidant à clarifier les objectifs et en fournissant un cadre pour étudier la cohérence entre les politiques d'enseignement et la réalisation des objectifs d'enseignement. Les modèles d'incidence sur les ressources peuvent être des outils utiles pour ces études.

(b) La nécessité de coordonner les procédures de planification à long terme avec les procédures utilisées pour la prise des décisions, l'établissement des budgets et la mise en oeuvre des programmes, n'implique pas qu'il faille modifier la répartition des tâches. La planification de l'enseignement devrait cependant être orientée vers la collecte d'informations propres à faciliter les décisions de caractère budgétaire. Par ailleurs, il est nécessaire de procéder à une révision systématique et continue des structures et procédures budgétaires, afin qu'elles correspondent aux objectifs actuels d'ordre politique. Cette harmonisation des fonctions de planification et d'établissement des budgets exige une analyse attentive des objectifs, des ressources, des instruments de politique et de leur interdépendance. Un effort dans ce sens faciliterait l'application de techniques de gestion, telles que l'analyse coût-bénéfice, l'analyse coût-efficacité, les modèles de coûts, l'analyse des instruments de politique, etc.

(c) Il importe d'adopter une procédure budgétaire qui permette de revoir périodiquement l'ensemble des programmes, par opposition aux procédures budgétaires annuelles, dans lesquelles une très large part des dépenses est déjà engagée.

(d) Il existe déjà un certain nombre de modèles et de structures budgétaires types pour la programmation budgétaire de l'enseignement aux divers niveaux de l'administration. On devrait s'efforcer d'utiliser les connaissances existantes et d'organiser une formation spécialisée à l'intention des personnes affectées à ces activités.

(e) La planification par programmes fait intervenir un certain nombre de méthodes et de démarches dont aucun n'est entièrement nouveau. Elle peut, cependant, amener à envisager certains changements progressifs et une application plus large de certaines techniques pour faciliter la planification et l'élaboration de la politique en matière d'enseignement.

A PERSONAL IMPRESSION

by John Vaizey

This was a meeting of some complexity with a number of different strands in the discussion, so an apology must be offered in advance for the inadequacy of the treatment of the subject, and especially the fact that this note will not deal with all the valuable contributions that were made. Here, however, the main issues are presented and analysed. The OECD secretariat in introducing the meeting pointed out that in education, as in some other parts of the public sector, there is both a short run and a long run planning problem. The whole context of the discussion was to put into perspective various possible methods of achieving the reconciliation of these short run and long run objectives. One of the things that came out of the meeting was that there is a variety of ways - some of them new in education - of attempting to reconcile these two ends.

The secretariat pointed out that there has been a growing emphasis on the role of the budgeting procedure as such in the planning process. The interaction of budgetary procedures and planning procedures affects and changes both the planning process and the budgetary process. Characteristically, it seems, the budgetary procedure is an annual one; on the other hand, the planning process is usually a long term one. In any realistic attempt to reconcile these two procedures, it seems that there has to be a long term budgetary process to supplement the annual one.

The second main point of departure was that in education (as in many other aspects of the public sector) the service has multiple objectives. The problem is the reconciliation of these complex objectives. Hitherto the O.E.C.D. has concentrated on trying to reconcile these complex objectives with each other through the planning procedures which it has been associated with in a number of countries. Planning procedures (especially of manpower forecasting) have evolved in many countries in the MRP and EIP programmes. Now several O.E.C.D. Member countries are trying to explore the new budgetary systems which are evolving, and which also purport to represent an additional method (and some would hold an alternative method) of reconciling the short and the long term, and reconciling complex and sometimes divergent objectives. The starting point of the meeting, therefore, was interest in the rapid development of programme budgeting, and in related techniques of analysis - a development that has occurred in recent years particularly in North America and Sweden - and its possible relationship to educational planning procedures. Professor Werner Hirsch pointed out in his opening comments on his paper that the central problem of long term planning, and of budgetary programming, was 'to try and play around with a variety of more or less open-ended, unstructured models which enabled you to check the consistencies within your planning procedure, or perhaps check for inconsistencies within your planning procedure.' This postulation of planning and PPBS procedure as essentially open-ended models, which enable a wide range of alternatives to be considered, that Professor Hirsch enunciated in his opening speech, became a central issue of the discussion. It might not unfairly be characterised as a discussion between the 'budgetary' protagonists on one side and the 'planners' on the other. They accepted the common objective of 'playing around with a variety of unstructured models', but there were considerable differences about the relative merits of the various techniques used in achieving this objective.

The other two papers that were presented on the first morning were Professor Hartley's valuable and important study of what experiments in PPBS are occurring in local school systems in the United States, and the Danish study of three-year budgets. Professor Hartley made two central points. So far there have been very few attempts to undertake PPBS procedures in local school systems in the United States, and what attempts there are, are in their very early stages. Secondly, the costs of installation of these procedures have been exceptionally heavy. In other words PPBS at the local school district level is not a cheap or easy tool which has been widely tested in the United States. One could also say that the Greater London Council, in England, has been interested in a programme of PPBS, but so far has been able to do little in the government of London, presumably for the same reason as the Americans; PPBS is an expensive procedure to introduce, and a very complex one. The Danish paper drew attention to the fact that in Denmark (and also, in parenthesis, one might add in a great many other countries too) there is a long term 'rolling' budget which has been evolved and which forms the basis of much of the annual budgeting procedures of many Departments of Finance or Treasuries throughout Europe and North America. A few countries - the specific examples that the meeting was given were Sweden and Canada - have gone further than this in that they have formally adopted some kind of PPBS procedure for their central budgetary mechanism. Again these arrangements are in their early stages and are not by any means a central part yet of the whole budgetary procedure. The same may well be said of President Johnson's adoption of the MacNamara doctrine in the United States Federal Government. Professor Hirsch was heard to observe some months ago that this PPBS in the Federal Government existed quite largely on paper in Washington, and not in many actual practical instances.

There followed a number of important papers which dealt with several cost models which have been evolved. The striking example that was presented was from the Federal Republic of Germany, which in essence drew from a number of other developments which had taken place in other countries. There was then an extremely powerful presentation by Professor Judy and his colleagues of a paper dealing with the experiments in the installation of systems analysis procedures in the medical faculty of the University of Toronto. Many delegates felt that this immensely intriguing and important contribution may well be a model that the O.E.C.D. should seek to see tried out in a number of other countries. To try to get a university to think rationally about the allocation of resources is difficult, and any effective tool, however complex, is desirable. It is to be hoped that this model will become generally available. The fact that it has been used in a Faculty of Medicine is especially hopeful since this is a refuge of academic conservatives in many universities.

The meeting then turned to the question of what incentives could be used to try to achieve a more rational allocation of resources within education. This was one of the less satisfactory parts of the discussion because it was not wholly clear what the point of that discussion was. It was suggested in the papers that various techniques - planning or PPBS, to take two examples - had to get people to act in certain ways, and therefore the question of incentives was clearly an important one; it is a discussion akin to the effectiveness of the price system versus direct controls, that now rages in Eastern Europe, and was a perennial topic of discussion in the economies of the post-World War II period. The discussion was made clearer by the subsequent discussion of Professor Blaug's paper.

A more general and perhaps much more speculative evaluation of what these two discussions really concerned may well be in some respects in order. Intellectual history is a difficult exercise to embark upon, but one brief point may be made. Because of the widespread unemployment in the 1930's, economists turned their attention (and notably, of course, Lord Keynes turned his attention) to the problems of analysing the causes of unemployment. The Keynesian and Swedish revolutions in economic thought then occurred. This was followed by the development, at the level of applied economics, of national income accounting, and of proposals for reformulating the budget in the context of a full employment budget. It was pointed out at that time that the old concept of a balanced budget of financial flows bore little or no relation to the role of a budget in a post-Keynesian situation. Sir John and Lady Hicks devoted some of their energies in the earlier 1940's to drawing up new forms of government accounts which would enable governments to achieve the objectives - full employment with stable prices - which they were setting themselves as a result of the Keynesian revolution. Thus there was a progression from unemployment to the intellectual formulation of a new budgetary structure. A similar situation faces economists, if the intellectual background of PPBS is examined. In the great growth of public expenditure which has occurred in the Western world since World War II, there has been a more or less unsatisfactory situation in allocating resources. No systematic, intellectually defensible, system for allocating these resources existed during the period of growth. If one compares Lever's Economics of Control or other classic texts, with what actually occurred, the intellectual gap is self-evident, particularly, perhaps, was this true of the military and defence sectors, where pressures for various new weapons systems led to an enormous increase in defence expenditure with no apparent rationale. A major factual basis for the new kind of thinking in public finance, witnessed by Hitch and McKean's work, is that this kind of problem cannot be solved by appealing to the rationality of the market - because *by definition* there is and *can be* no market in the defence situation, or in many other parts of the public sector. Secondly, there have been certain intellectual developments in the field of welfare economics. One notes, first, the development of Pigovian welfare economics, of concepts, of private and social costs and benefits. There was then a great debate in socialist economics about whether or not there could be a 'rational' economy with a non-price, non-market, system. The Hayek-Lange debate is central to the intellectual origins of PPBS, since PPBS is a system of trying to set out a logic of choice in terms of trade-offs. These trade-offs have to have some sort of numerator. That is what the debate was about. If these trade-offs can be agreed, not subjectively but generally, then a 'rational' system is possible.

Therefore it seemed that underlying the discussion was a move from an intellectual formulation of the rationality of the non-market sector, which had practical consequences, just as the Keynesian revolution led to new budgetary functions. In this context, (i) PPBS is basically an educational device - a device among a number of others - to elucidate goals, to elucidate alternative means of achieving those goals, and therefore to improve the dialogue between those who are providing the resources and those who are making use of the resources, to improve the dialogue, that is, between the executive departments and the central financial departments. (ii) Arising from this need for an improved dialogue, is the question whether there is therefore a need for a formal reform of the budget structure. Or, in fact, is it better done by a continuous review of the budgetary process, and a continuous process of improving the budgetary presentation? (iii) How can people become accustomed to thinking in terms of trade-offs? (iv) To do this there is a need for more competent, trained, people to think about trade-offs and to formulate procedures, especially if a nation fiscally goes over to a PPBS system. In almost all the papers, it was shown that going over to PPBS involves substantial outlays on trained and qualified manpower.

It was at this point that a central question was raised. This was the complex question of whether the ordering of the priorities (according to these means just adumbrated, or by any other means) takes place in a budget bureau (a Department of Finance or Ministry of Finance) or whether it is done by the planning bureau. It was the link and the co-ordination between the planning process and the budgetary process which was a continuous undercurrent in a great deal of this discussion. It did not take the form of a formal dialogue between planners on the one hand and the PPBS people on the other hand, but there was a distinction between those who thought that programme preparation was the central part of the planning procedure and those who thought that this should be (and could be) formalised in a budgetary procedure. Obviously national experience differs, and colours opinions on this question. Hitherto, O.E.C.D. work in relation to education has tended to concentrate on problems of planning. If this meeting came out - under O.E.C.D. auspices - in favour of PPBS, it might look rather as though O.E.C.D. was not maintaining certain of its earlier positions. This was one of the central questions. In fact there was no necessary conflict. An attempt at reconciliation might be this: educational planning activities should be oriented towards the provision of information relevant to budgetary decisions. Budgetary structures and procedures, on the other hand, may need systematic and continuous revision to be in line with currect policy objectives. This harmonisation of planning and budgetary functions requires careful analysis of goals, resources and policy instruments and of their mutual interdependence. Developments in this direction would also facilitate the more extensive application of such management techniques as cost benefit analysis, cost effectiveness analysis, the application of cost models, policy instrument analysis, and so on. These techniques, although still in the early stages of development, show considerable promise as tools for more rational decision-making.

Two crucial questions were raised in this connection. The first question arose from the fact that Member states are already in a situation where they have very large outlays on education and associated programmes. They are very heavily committed towards these outlays. How can they best review these existing programmes and, if need be, eliminate them? This was, of course, a central issue in the U.S. defence programme reconstruction by the MacNamara analysis. The extreme difficulty of giving up a particularly programme once it has been adopted was constantly stressed. The second question which was raised was how to add up disparate non-monetary benefits. This was the question to which Professor Blaug addressed himself. This was one of the key issues, which is, of course, a general economic issue.

The next question that arose from what Professor Judy and Professor Froomkin said, concerned the function of PPBS and the other new techniques - a function that was put as to try to open up a problem, to examine different ways of solving it, to improve the quality of decision-making, to improve the implementation of decisions. Professor Froomkin summed up his position by saying that the PPBS system is a sorting out of objectives, and a trading-off between those objectives. To this, Professor Hartley made the very important reservation that, in fact, when one tried to set out educational objectives and to quantify them, what one got was a 'rag-bag of clichés and truisms'. It was, in fact, a much more difficult task to set out these objectives of education than is sometimes believed.

In addition, at the technical level, it is difficult to formulate alternative means of attaining objectives, because it is difficult to open up the production function of education. If alternative courses of action were proposed, it would be necessary to try and say to a school (for example), 'would you rather have ten thousand dollars to spend on a teacher, or on a non-teacher, or on equipment?' There are many intellectual problems to be faced in this matter in the pedagogic sense, and there are also all sorts of administrative and budgetary problems to overcome. That point was made most forcibly by Mr Hammar from Sweden. In the specific examples that were given at the meeting, a number of useful tools were made available which would come in what Professor Hirsch called 'sub-programmes'. These were the cost models, the improvement of cost models, the systems approach that Professor Judy had devised at the University of Toronto, special studies such as those that Professor Blaug spoke of, about the calculation of the private rate of returns and its influence on decisions by students - and in addition to these 'sub-programmes' there were the intellectual problems of the total factor productivity approach and the statistical problems of doing cost-benefit studies in education. The statistical problems were especially serious because of the vagueness of the concepts and because of the difficulty in finding the relevant data. This availability of data was a central and important question. PPBS is intellectually impressive; but the technical problems which have accompanied its introduction, and the political hostility that has to be overcome at the point of introduction, may make it pragmatically less impressive. Political hostility is not unimpotant.

In many countries the formulation of the budget in Keynesian terms has not occurred; most budgets are pre-Keynesian budgets. Political objections arise not only because of innate conservatism, but because the major aim of PPBS is to have existing programmes brought under review - and 'brought under review' is, of course, sometimes a euphemism for 'thrown out'. Opposition to PPBS is a fight between programmes as well as a fight between budgetary techniques.

In summary, it might be possible to put forward certain points that seemed to command assent. First, the educational system with its multiple objectives and levels of devision-making has a special need of techniques such as cost-effectiveness analysis for the evaluation of its programmes, and for budgeting systems which make these possible. Furthermore, many of the objectives of education are by their nature very long term and budgetary decisions often have long term implications, whereas public authorities are unwilling to make long term budgetary commitments. This makes the setting of objectives and the planning and implementation process a particularly complex task in which budgetary procedures have an important role to play.

Secondly, programme budgeting and cost-benefit analysis are important for organising thinking about relationships between objectives and their implementation.

Thirdly, it is important to adopt a budgetary procedure that allows a periodic review of total programmes, as opposed to an annual budgeting procedure in which very large proportions of expenditure (and in education this may well be 98% of the expenditure) are already, in fact, committed.

Fourthly, a number of models and formal budget structures exist for programme budgeting in education at various levels of administration and attention should be given to the provision of some specialised training to economists and others who have the necessary intellectual background.

Fifthly, budgetary procedures and structures and administrative and planning procedures and structures are closely linked, and there is a major need for innovation and flexibility in both, so that complementary and conflicting objectives become apparent. They can be readily evaluated and incorporated within the budgetary system.

Sixthly, emphasis was laid on the importance of analytical studies to provide information relevant to the programme budgeting system.

IMPRESSIONS SUR LA RÉUNION

par John Vaizey

Cette réunion a présenté une certaine complexité, et les discussions se sont engagées dans plusieurs voies différentes, de sorte que je dois m'excuser à l'avance des insuffisances de mon exposé, et notamment du fait que dans la présente note il ne sera pas fait état de toutes les contributions intéressantes qui ont été apportées au débat. Toutefois, les principaux problèmes seront évoqués et analysés. Le Secrétariat de l'O.C.D.E., introduisant le débat a souligné que dans l'enseignement, comme dans d'autres parties du secteur public, il existe un double problème de planification, à court terme et à long terme. L'ensemble de la discussion avait pour objet d'apprécier la valeur relative de diverses méthodes permettant de concilier ces objectifs à court et long terme. L'un des faits saillant de la réunion est, qu'il existe plusieurs voies possibles pour atteindre ces buts, dont certaines revêtent un caractère novateur dans le domaine de l'enseignement.

Le Secrétariat a signalé que les procédures budgétaires acquièrent une importance croissante dans le processus de planification. L'interdépendance des procédures budgétaires et des procédures de planification influence et modifie autant le processus de planification que le processus budgétaire. Il semble que de façon générale la procédure budgétaire soit de nature annuelle ; en revanche, la planification est généralement à long terme. Pour essayer, avec quelques chances de succès, de coordonner ces deux procédures, il semble donc que le budget annuel doive être complété par un processus budgétaire à plus long terme.

Le deuxième point important vient du fait que dans l'enseignement, comme dans beaucoup d'autres parties du secteur public, le service répond à des objectifs multiples. Tout le problème consiste à concilier ces objectifs complexes. Jusqu'à présent, l' O.C.D.E. s'est principalement efforcé de concilier ces objectifs complexes les uns avec les autres au moyen des procédures de planification à l'élaboration desquelles elle a participé dans un certain nombre de pays. Des procédures de planification (et notamment de prévision de main-d'oeuvre) ont été mises au point dans beaucoup de pays dans le cadre des programmes PRM et IPE. Actuellement plusieurs pays Membres de l'O.C.D.E. s'efforcent d'étudier les nouveaux systèmes budgétaires en voie d'élaboration, qui visent à constituer une méthode complémentaire (certains diraient une méthode de rechange) pour concilier le court et le long terme, et pour harmoniser des objectifs complexes parfois divergents. Le point de départ de la réunion était donc l'intérêt manifesté pour le développement rapide des budgets de programme et des techniques connexes d'analyse - développement qui s'est produit au cours des dernières années plus particulièrement en Amérique du Nord et en Suède - et ses rapports éventuels avec les méthodes de planification de l'enseignement.

Le Professeur Werner Hirsch, en présentant sa contribution, a signalé que le problème central de la planification à long terme et de l'établissement de budgets de programme consiste à s'efforcer de manipuler un certain nombre de modèles plus ou moins "ouverts", non structurés, qui permettent de vérifier les aspects compatibles de la procédure de planification, ou peut-être de déceler les facteurs d'incompatibilité de cette procédure. Ce postulat, fondant la planification et la procédure de budgétisation programmée (PPBS) sur la construction de modèles essentiellement "ouverts", permettant de prendre en considération une large gamme de variantes, que le Professeur Hirsch a énoncé dans son allocution d'ouverture, a joué un rôle central dans la discussion. Ce débat peut-être assez justement qualifié de confrontation entre partisans de la théorie "budgétaire" et "planificateurs". Les uns et les autres se rallient à l'objectif commun consistant à "manipuler un certain nombre de modèles non structurés", mais des divergences de vues considérables sont apparues quant aux mérites relatifs des diverses techniques permettant d'atteindre cet objectif.

Les deux autres documents qui ont été présentés le premier matin étaient la précieuse et importante étude du Professeur Hartley sur les expériences de budgétisation programmée effectuées aux Etats-Unis à l'échelon des écoles locales, et l'étude du Danemark sur les budgets de trois ans. Le Professeur Hartley a mis en lumière deux points essentiels. Jusqu'à présent, on a très rarement essayé d'établir des méthodes PPBS dans les systèmes scolaires locaux aux Etats-Unis, et les quelques tentatives entreprises sont encore à leurs débuts. En second lieu, les coûts de mise en place de ces méthodes ont été exceptionnellement lourds. Autrement dit, la budgétisation programmée à l'échelon du district scolaire local ne saurait être considérée comme un instrument à bon marché ou facile, largement mis à l'épreuve aux Etats-Unis. On peut aussi dire que le "Greater London Council" (Conseil du Grand Londres), en Angleterre, s'est intéressé à un programme de PPBS, mais jusqu'à présent n'a pas été en mesure de faire grand chose dans ce sens dans l'administration de Londres, probablement pour la même raison qu'en Amérique : la budgétisation programmée est une procédure coûteuse à introduire, et très complexe. Dans le document du Danemark, il est souligné que dans ce pays (et aussi, entre parenthèses, dans beaucoup d'autres pays) il existe un budget "prévisionnel" à long terme, qui sert de base à une bonne partie des procédures budgétaires annuelles de beaucoup de Départements des finances ou du Trésor dans tous les pays d'Europe et d'Amérique du Nord. Quelques pays -les exemples concrets cités au cours de la réunion sont la Suède et le Canada- ont fait un pas de plus en adoptant officiellement une sorte de budgétisation programmée pour leur mécanisme budgétaire central. Là aussi, ces dispositions en sont à leur début et sont encore loin de jouer un rôle central dans la procédure budgétaire. On pourrait en dire autant de l'adoption par le Président Johnson de la doctrine MacNamara pour le Gouvernement fédéral des Etats-Unis. Il y a quelques mois, nous avons entendu le Professeur Hirsch dire qu'au Gouvernement fédéral cette budgétisation programmée n'existait dans une large mesure que sur le papier à Washington, et ne comportait pas en fait beaucoup d'applications pratiques.

Ensuite ont été présentés plusieurs importants documents consacrés aux divers modèles de coûts qui ont été établis. L'exemple le plus frappant a été fourni par la République fédérale d'Allemagne qui s'est inspirée essentiellement d'un certain nombre d'expériences entreprises dans d'autres pays. Le Professeur Judy et ses collègues ont présenté avec une grande maîtrise un document traitant de l'application des méthodes d'analyse des systèmes à la Faculté de Médecine de l'Université de Toronto. Beaucoup de délégués ont eu l'impression que cet important et passionnant rapport offre un modèle dont l'O.C.D.E. devrait promouvoir l'essai dans un certain nombre d'autres pays Membres. Il est difficile d'amener une université à réfléchir de façon rationnelle à la répartition de ses ressources, et tout instrument efficace, si complexe soit-il, est le bienvenu à cet égard. Il faut espérer que ce modèle deviendra accessible à tous. Le fait qu'il ait été utilisé dans une Faculté de médecine est particulièrement encourageant, car cette Faculté, dans beaucoup d'universités, est le refuge des éléments académiques conservateurs.

Le débat s'est ensuite orienté vers la question des stimulants qui pourraient être utilisés pour essayer d'aboutir à une répartition plus rationnelle des ressources au sein du système d'enseignement. Cette partie de la discussion a été l'une des moins satisfaisantes, parce que l'objet du débat n'était pas parfaitement clair. Il était suggéré dans les documents traitant de cette question que diverses techniques - planification ou PPBS, pour citer deux exemples - doivent être utilisées pour amener les hommes à agir d'une certaine manière, et qu'en conséquence la question des stimulants est évidemment d'importance ; ce débat rappelle la controverse entre l'efficacité relative du système du marché et du système des contrôles directs, qui passionne actuellement l'opinion en Europe orientale, et qui n'a cessé d'être à l'ordre du jour des débats d'ordre économique pendant la période qui a suivi la deuxième guerre mondiale. La discussion est devenue plus claire par la suite, lorsqu'a été examiné le document du Professeur Blaug.

Il convient peut-être à certains égards de procéder à une évaluation plus générale et sans doute beaucoup plus hasardeuse de l'objet de ces deux discussions. Il est toujours difficile de retracer l'historique d'un affrontement intellectuel, mais une brève observation est cependant possible. En raison de l'ampleur du chômage pendant les années 1930, les économistes (et surtout, bien entendu, Lord Keynes) se sont préoccupés des problèmes que soulève l'analyse des causes du chômage. C'est alors que se sont produites, dans le domaine des sciences économiques, les révolutions keynésienne et suédoise, qui ont été suivies par le développement, à l'échelon de l'économie appliquée, de la comptabilité nationale, et des propositions tendant à réformer la présentation du budget dans le contexte d'un budget de plein emploi. Il avait été souligné à cette époque que le vieux concept de budget équilibré en termes de flux financiers n'avait que peu ou pas de rapport avec le rôle que doit jouer un budget dans une situation post-keynésienne. Sir John Keynes et Lady Hicks ont consacré certains de leurs efforts, au début des années 40, à l'établissement de nouvelles formes de comptes publics permettant au gouvernement d'atteindre les objectifs - plein emploi et stabilité des prix - qu'ils s'étaient fixés eux-mêmes à la suite de la révolution keynésienne. Il y a ainsi eu une relation de cause à effet entre le chômage et la formulation intellectuelle d'une nouvelle structure budgétaire. Les économistes se trouvent en présence d'une situation analogue, si l'on examine les origines intellectuelles de la budgétisation programmée. Avec l'accroissement considérable des dépenses publiques enregistré dans le monde occidental depuis la deuxième guerre mondiale, une situation plus ou moins mauvaise est apparue en matière de répartition des ressources. Il n'existait pendant cette période de croissance aucune méthode systématique et intellectuellement défendable pour la répartition de ces ressources. Si l'on compare le livre "Economics of Control", de M. Lever, ou d'autres textes classiques, avec ce qui s'est passé effectivement, le décalage intellectuel est évident - plus particulièrement, peut-être, dans les secteurs militaires et de la défense, où les pressions qui s'exerçaient en faveur de l'introduction de nouveaux systèmes d'armes ont provoqué une augmentation gigantesque des dépenses de défense sans justification rationnelle visible. L'un des principaux faits sur lesquels s'appuie ce nouveau type de théorie des finances publiques, comme le montrent les travaux de Hitch et McKean, est que ce genre de problème ne peut être résolu par le recours aux forces naturelles du marché - parce que par définition il n'y a pas et il ne peut pas y avoir de marché dans le secteur de la défense, pas plus que dans beaucoup d'autres parties du secteur public. En second lieu il s'est produit une certaine évolution intellectuelle dans le domaine de l'économie "sociale". On remarque tout d'abord le développement de l'économie sociale "pigovienne", l'élaboration des concepts de coûts et bénéfices privés et sociaux. Il y a eu ensuite une grande controverse parmi les économistes socialistes sur la question de savoir s'il pouvait ou non exister une économie "rationnelle" dans un système sans prix ni marché. La controverse Hakey-Lange occupe une place centrale dans les origine intellectuelles du PPBS, car ce système tend à fournir une base logique aux choix à faire entre plusieurs solutions possibles, en définissant certaines mesures d'efficacité. Ces mesures doivent se fonder sur un type quelconque de numérateur commun. C'est sur ce point que portait le débat. Si ces mesures d'efficacité peuvent être acceptées, non pas subjectivement mais de façon générale, un système "rationnel" devient possible.

Il semble donc que toute cette discussion se ramenant à une tentative visant à formuler intellectuellement les bases rationnelles du secteur étranger au marché, tentative qui avait des conséquences pratiques, tout comme la révolution keynésienne avait abouti à assigner de nouvelles fonctions au budget. Dans ce contexte :

(i) Le PPBS est fondamentalement un instrument, - parmi beaucoup d'autres - destiné, dans le secteur de l'enseignement, à définir plus clairement les objectifs, à mettre en lumière plusieurs moyens possibles d'atteindre ces objectifs, et par suite à améliorer le dialogue entre ceux qui fournissent les ressources et ceux qui les utilisent, c'est-à-dire entre les services administratifs de l'enseignement et les services financiers centraux.

(ii) Une fois admise la nécessité d'un tel dialogue amélioré, la question se pose de savoir s'il faut procéder à une réforme officielle de la structure budgétaire. Ou bien est-il préférable de procéder à une révision continue du processus budgétaire, et à un processus continu d'amélioration de la présentation du budget ?

(iii) Comment peut-on habituer les intéressés à penser en termes d'échanges d'objectifs ?

(iv) Pour cela il faut disposer d'un plus grand nombre d'individus formés et compétents capables de réfléchir aux échanges nécessaires et de formuler des procédures, notamment si le système fiscal d'un pays est réformé conformément à la méthode PPBS. Dans presque tous les documents, il est signalé que l'adoption de la budgétisation programmée exige des ressources substantielles en personnel formé et qualifié.

C'est à ce point qu'a été soulevée une question fondamentale, d'ailleurs complexe : la détermination des priorités (par les moyens que nous venons d'esquisser, ou par tout autre moyen), doit elle être faite par un service budgétaire (Département ou Ministère des Finances) ou par le Service de Planification ? Une grande partie de cette discussion tournait autour du problème du lien et de la coordination entre le processus de planification et le processus budgétaire. Cet affrontement n'a pas revêtu la forme d'un dialogue académique entre planificateurs d'une part et partisans du PPBS d'autre part, mais il y avait une divergence de vues entre ceux qui pensaient que la préparation du programme était la partie centrale de la procédure de planification, et ceux qui pensaient que cette préparation devrait être (et pourrait être) officialisée dans le cadre d'une procédure budgétaire. Les expériences nationales diffèrent évidemment, et les opinions sur cette question reflètent ces différences. Jusqu'à présent, les travaux de l'O.C.D.E. dans le domaine de l'enseignement ont surtout porté sur les problèmes de planification. Si cette réunion aboutissait - sous les auspices de l'O.C.D.E.- à donner la préférence au PPBS, l'O.C.D.E. risquerait de donner l'impression qu'elle abandonne certaines de ses positions antérieures. C'était là une des questions au coeur du débat. En fait, le conflit n'est pas inévitable. Une tentative de conciliation pourrait revêtir la forme suivante : les activités de planification de l'enseignement devraient être orientées vers le rassemblement et la diffusion d'informations intéressant les décisions budgétaires. D'autre part, les structures et procédures budgétaires devraient peut-être faire l'objet d'une révision systématique et continue pour répondre aux objectifs politiques du moment. Cette harmonisation des tâches de planification et des fonctions budgétaires exige une analyse soigneuse des objectifs, des ressources et des instruments de politique et de leur interdépendance. Une évolution dans ce sens faciliterait également l'application plus large de techniques de gestion telles que l'analyse coût-bénéfice, l'analyse coût-efficacité, l'application de modèles de coût, l'analyse des instruments de politique, etc. Ces techniques, bien qu'elles soient encore à peine ébauchées, apparaissent comme des instruments très prometteurs pour une rationalisation du processus de prise de décisions.

Deux questions d'importance capitale ont été soulevées à ce sujet. La première découle du fait que les pays Membres doivent dès à présent consentir des investissements très importants dans l'enseignement et les programmes connexes. Ils ont pris des engagements très fermes au sujet de ces investissements. Comment doivent-ils réviser de la meilleure manière possible leurs programmes actuels, et au besoin les éliminer ? Ce problème a évidemment joué un rôle fondamental dans la réorganisation du programme de défense des Etats-Unis qui a suivi l'analyse de M. MacNamara. On a constamment souligné alors à quel point il est difficile de renoncer à l'exécution d'un programme précis une fois qu'il a été adopté. La seconde question qui a été soulevée consiste à savoir comment on peut additionner des avantages non monétaires de nature disparate. C'est cette question qu'a étudiée le Professeur Blaug. C'était l'un des problèmes clés qui ont été traités, et il s'agit évidemment d'une question économique d'ordre général.

La prochaine question qui a été soulevée, à la suite des déclarations du Professeur Judy et du Professeur Froomkin, concernait le rôle du PPBS et des autres techniques nouvelles - rôle qui consiste à dégager les données d'un problème, à examiner les différentes manières de le résoudre, à améliorer la qualité des prises de décisions et l'application de ces décisions. Le Professeur Froomkin a résumé sa position en déclarant que le système PPBS consiste à classer les objectifs et à renoncer à certains objectifs au profit d'autres. Le Professeur Hartley a complété cette déclaration en formulant une réserve très importante : en fait, lorsqu'on essaye de fixer les objectifs de l'enseignement et de les quantifier, on aboutit à un "ramassis de clichés et de truismes". En fait, la définition des objectifs de l'enseignement est une tâche bien plus ardue qu'on ne le croit parfois.

En outre, à l'échelon technique, il est difficile de formuler plusieurs moyens différents d'atteindre les objectifs, parce qu'il est difficile de définir la fonction de production de l'enseignement. Si l'on proposait plusieurs modes d'action différents, il faudrait essayer de dire à une école (par exemple) "préféreriez-vous dépenser 10.000 dollars pour un enseignant, ou pour un non-enseignant, ou pour du matériel?" Il se pose à cet égard beaucoup de problèmes intellectuels de nature pédagogique, et il y a aussi des difficultés budgétaires et administratives de tous genres à surmonter. C'est un expert suédois, M. Hammar, qui a souligné ce point avec le plus de force. Dans les cas concrets qui ont été cités au cours de la réunion, on a utilisé un certain nombre d'instruments utiles qui relèveraient de ce que le Professeur Hirsch a appelé "sub-programmes". Ces instruments sont les modèles de coûts, l'amélioration des modèles de coûts, la méthode des systèmes que le Professeur Judy a mise au point à l'Université de Toronto, les études spéciales du genre de celles dont a parlé le Professeur Blaug au sujet du calcul du taux privé de rendement et de son influence sur les décisions prises par les étudiants ; outre ces "sub-programmes", d'autres problèmes théoriques se posent aux spécialistes du PPBS : étude de la productivité totale des facteurs, et problèmes statistiques, à propos des études coût-bénéfice en matière d'enseignement. Les difficultés statistiques sont particulièrement graves en raison de l'imprécision des concepts et de la difficulté d'accéder aux données pertinentes. Ce problème de l'accessibilité des données est une importante question qui a toujours été au centre des débats. Sur le plan intellectuel, le système de budgétisation programmée est très séduisant, mais les problèmes techniques qui ont accompagné son introduction, et l'hostilité politique qui a dû être surmontée au moment de son adoption, lui enlèvent beaucoup de ses atouts sur le plan pratique. L'hostilité politique n'est pas un facteur négligeable.

Dans de nombreux pays, le budget n'est pas préparé conformément à la doctrine Keynésienne ; la plupart des budgets sont de nature pré-keynésienne. Les objections politiques se produisent non seulement en raison d'un conservatisme inné, mais parce que l'objectif principal du PPBS est de provoquer une révision des programmes actuels - et le terme "révision" est évidemment parfois un euphémisme pour "suppression". L'opposition au PPBS découle d'un conflit entre programmes aussi bien que d'un conflit entre techniques budgétaires.

En bref, il est peut-être possible de dégager certains points d'accord. Premièrement, le système d'enseignement, étant donné la multiplicité de ses objectifs et de ses niveaux de prises de décisions, a particulièrement besoin de techniques telles que l'analyse coût-efficacité pour l'évaluation de ses programmes, et de systèmes budgétaires qui rendent possibles une telle évaluation. En outre, beaucoup d'objectifs de l'éducation, par leur nature même, sont à très long terme, et les décisions budgétaires ont souvent des incidences lointaines, tandis que les pouvoirs publics sont peu disposés à prendre des engagements budgétaires à long terme. De ce fait, l'établissement d'objectifs et les processus de planification et d'application des plans deviennent une tâche particulièrement complexe, dans laquelle les procédures budgétaires ont un rôle important à jouer.

Deuxièmement, la budgétisation programmée et l'analyse coût-bénéfice peuvent grandement faciliter l'étude rationnelle des rapports entre les objectifs et leur réalisation.

Troisièmement, il importe d'adopter une procédure budgétaire permettant une révision périodique des programmes globaux, de préférence à une procédure budgétaire annuelle suivant laquelle une très grande proportion des dépenses (qui en matière d'enseignement peut atteindre 98 %) est déjà en fait engagée.

Quatrièmement, il existe un certain nombre de modèles et de structures budgétaires officielles pour la budgétisation programmée dans l'enseignement à divers niveaux de l'administration, et il conviendrait de prévoir une certaine formation spécialisée pour des économistes et d'autres personnes possédant l'acquit intellectuel nécessaire.

Cinquièmement, il existe un lien étroit entre les procédures et structures budgétaires, d'une part, et d'autre part les procédures et structures d'administration et de planification, et dans ces deux domaines un grand effort d'innovation et de diversification s'impose, afin que deviennent apparents les objectifs complémentaires et les objectifs contradictoires. Ces objectifs pourraient alors être aisément évalués et incorporés au système budgétaire.

Sixièmement, la réunion a montré le rôle important que peuvent jouer les études analytiques pour fournir des informations intéressant le système de budgétisation programmée.

INTRODUCTION TO PROGRAMME BUDGETING AND COST-EFFECTIVENESS ANALYSIS IN EDUCATIONAL PLANNING

by Brita Schwarz

New management techniques such as programme budgeting and cost-effectiveness analysis have in recent years been investigated and to some extent applied in various sectors of society. In the first section some new terms, now in frequent use in this context are defined. Subsequently some general principles as to the application of the new techniques to educational planning are discussed. References to some of the recent literature in the field are given.

I. GENERAL DEFINITIONS

A. Programme Budgeting

The term programme budgeting is used with a somewhat varying meaning in different contexts. It implies, however, a partition of the activities considered in "programmes" or "end-objective" oriented categories and a presentation of their costs in accordance with these programmes. A programme might consist of primary education or of a 1-year prolongation of the compulsory school education or school-lunches, just to give some examples. The costs or benefits of a programme usually cover several years. A longer time horizon than in the normal 1-year budget is therefore usually required to enable the benefit of a programme to be weighed against its cost. This time issue is an important feature of the programme budgeting concept.

In addition to budgeting according to programmes with a time horizon sufficiently long for full consideration of the programme, programme budgeting is often also taken to include the use of some kind of cost-effectiveness or cost-benefit analysis as a basis for the decision-making. The purpose of such analyses is to examine alternative courses of action in terms of benefit and cost in order to clarify the relevant choices available to the decision-maker.

The way the budget displays proposed expenditures varies, of course, between different countries. Often the budget structure was originally designed mainly for the purpose of facilitating administrative implementation and account control. However, the budget should also be designed so as to facilitate decision making concerning the allocation of resources. The increasing importance of this budget task has lately drawn attention to the need for new methods of financial reporting. By redesigning the budget procedure to make the budget clearly express not only the short-term, but also the long-term resource allocation, the budget can be made to improve the integration of long-range and short-term planning.

In many countries the same budget design serves both decision and implementation objectives. It is, however, possible to use different budgetary structures for the two different purposes, provided a translation between them can be made easily. This kind of "translation" can be facilitated by the use of computers. The budget structure suitable for administrative implementation and account control is usually input or object oriented. In this case, the education budget usually is divided into different appropriations for teachers' salaries, school materials, school-buildings, etc. The programme budget is more output or end-objective oriented with a division of costs e.g. between different school levels, target groups etc. For the colleges or universities, for instance, costs are separately attributed to teaching and research.

The first large scale use by a national government of programme budgeting was probably in the Department of Defense in the United States where it was introduced in 1962. In order to extend the use of programme budgeting to other fields of application, a number of articles treating the general ideas of programme budgeting have appeared. For instance, "Program Budgeting" /1/, edited by D. Novick, contains some introductory chapters on the basic theory of programme budgeting. Chapter 1, by Melvin Anshen, treats "The Federal Budget as an Instrument for Management and Analysis".

In Chapter 2 Arthur Smithies gives "The Conceptual Framework for the Program Budget" and Chapter 3 is a contribution by Gene H. Fisher on "The Role of Cost-Utility Analysis in Program Budgeting". A number of Rand documents by the same authors contain similar treatments of the subject, for instance "The World of Program Budgeting" by G.H. Fisher /2/.

The division of different cost-bearing systems and activities according to end-objective related programmes is by no means a logically easy task, sometimes not even possible. This can be illustrated by the programme definitions used in the Department of Defense in the United States. A main reason for the budget reform in 1961 was the diminishing relevance of the traditional military service boundaries in the implementation of major missions or programmes. When the Polaris system was developed within

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Note: Figures in square brackets refer to the bibliography at the end of this document.

the Navy as a strategic deterrence system in 1958, it had to compete for resources within the Navy and thus, for instance, had to be compared with naval systems for convoy protection and troop transportation. However, as the Polaris' system apparently served the same purpose as some Army (land-based missiles) and Air Force systems, the resource allocation to the Polaris system should logically not be made within the Navy but within a general programme for strategic deterrence. This problem was solved by the budget reform in 1961-1962 by the introduction of a programme for Strategic Retaliatory Forces. The other new defence programmes were the following:

1. Continental Defense
2. General Purpose Forces
3. Airlift and Sealift
4. Research and Development
5. General and National Guard Forces
6. General Support
7. Military Assistance
8. Civil Defense

As one of the purposes of the Continental Defense Forces is to protect and warn the strategic forces it could be regarded as an element of strategic deterrence. There are, however, also reasons for treating it as a separate programme.

Airlift and Sealift are designed to increase the mobility of the General Purpose Forces and could thus be treated as an element of this programme. It is, however, considered as a separate programme because its components, airlift and sealift, should be considered as substitutes for each other and the best mix should be achieved.

The examples given above illustrate the point that although the division into defence programmes has advantages compared to the previous system, theoretically no complete programme budget has been established, nor is it logically possible to do so. Another problem in this context is the relationship between defence objectives and foreign policy objectives. For instance, the military and non-military assistance in the United States to other countries has probably, in some cases, closely related objectives which should be expressed in the programme definitions.

The logical problems encountered in connection with the programme definitions are likely to appear in other fields of application. This is due to the fact that the cost-bearing elements cannot very often be neatly divided into programmes so that there is a one-to-one correspondence between each programme and each objective. The conclusion of this is that a budget cannot usually be said to be or not to be a programme budget. It is rather to a smaller or larger extent a programme budget.

B. Incentives

One of the advantages of a programme budget system is the increased possibilities of decentralisation and of the creation of incentives for efficiency. If the appropriations are object instead of programme oriented, the programme responsibility must remain at the highest level of the organisation. It is, however, difficult to find efficient resource allocation within a programme at this level because of the lack of information. The detailed information which usually is required is more easily available at lower decision levels. But decision makers at lower levels often do not have the incentive to find and propose the most efficient resource allocation if they know that appropriations are more easily approved for some "objects" than for others. If, for instance, the same objective or effectiveness could be reached at a lower cost with less teachers and more teaching aids or more investments in school-buildings, there is no incentive for proposing such a change if appropriations for salaries are more easily approved. A partition of the appropriations according to programmes and perhaps a further partition of programmes into sub-programmes and programme elements with decision makers responsible for each programme (and perhaps sub-programme etc.) creates an incentive to investigate and propose (or decide) the best resource allocation within the programme. Some other examples of incentive could be mentioned. If the salary, for instance, paid by the government to an agency head, or to the head of a local school, is positively correlated to the current expenses of the agency, this creates an incentive to waste money. If the salary instead is positively correlated to the "output per unit cost" an incentive for efficiency is obtained.

If governmental funds are available for some types of "objects" necessary to fulfil a local programme, but not for all the objects necessary for the programme, this creates an incentive for the local authorities to waste money on the government financed objects. If the local authorities are the real decision makers an incentive for efficiency can be obtained by making the government funds available for all different kinds of expenses for the programme, but making the local authorities finance a considerable part of the programme. The main point is to formulate such financing rules that the real decision makers allocate the resources within a programme as if the total budget was fixed and no "free" resources were available. This can also be achieved if the government pays a fixed grant for a certain programme. An incentive to economize on current costs has been introduced in the defence organisation in the United States by making regional decision makers report on savings on already approved, annual expenses. These savings are then made available for other defence expenses.

Other kinds of incentives are those connected with industrial contracts, for instance, for the construction of school-buildings. If the contract stipulates that the payment to the industry should equal the expenses of the industry plus a fixed percentage this means that there is an incentive for the industry to spend as much as possible because this will increase the gain. Contracts giving incentives for saving, can, however, be constructed. This is the case if, for instance, part of the difference between a sum fixed in advance and the real costs known when the work is terminated is paid or gained by the industry. If the original sum has been too high the industry gets part of the gain and if it has been too low it pays part of the loss.

A change of the budget structure towards a programme oriented budget does not automatically increase decentralisation or improve incentives for efficiency. It might well be the opposite if these possibilities are not carefully studied. An increased centralisation might bring about a suppression of alternatives, despite the fact that a purpose of the programme budget is to help officials explore different alternatives systematically. However, an introduction of a programme budgeting system should involve such changes in the decision structure which are necessary to ensure that suboptimizations on a lower level are as consistent as possible with an optimization on the higher level. For an already fairly decentralized organisation this might mean further decentralization in some respects but less in others.

The centralization problem can be exemplified by the situation in the United States where education is primarily the responsibility of state and local government and according to, e.g. the United States Bureau of the Budget /17, p. 70/ it will still remain so after the introduction of the P.P.B.S. (Planning-Programming - Budget System). Yet it has been misinterpreted to imply increased centralization as follows e.g. from the article by E. Exton, "Word from Washington, Federal Programme Budgeting is a Step Towards Centralized Education Planning" /13/. The author also questions the objectivity of the system. However, the setting of objectives for education must always be a policy question.

Problems concerning the implementation and operation of a programme budget are discussed in Part III of the book on "Program Budgeting" /1/ mentioned above. It contains papers on limitations, risks, and problems by Roland N. McKean and Melvin Anshen; on the problems of implementation by George A. Steiner; and on the actual operation of the programme budget, when fully introduced, by Melvin Anshen.

C. Cost-effectiveness Analysis

A number of different terms with similar meaning such as cost-effectiveness, cost-utility and cost-benefit analysis are in current use. The term cost-benefit analysis, in recent years often used in economic theory, is mostly employed when the "benefit" of a project can be measured in units directly comparable to its costs, that is generally in monetary units. In this case the benefit/cost ratio is calculated to give a basis for decisions concerning the profitability of the project.

When the benefit of a project or programme cannot be calculated or estimated in monetary units, which is often the case for governmental activities, another approach is to define some measure of effectiveness or utility which is related to the objective of the activity envisaged. The cost-effectiveness analysis can then take either of the two following forms:

(1) A comparison is made between the costs of different alternatives having the same measure of effectiveness, that is fulfilling the objective to the same extent. The less costly alternative is then considered to be the best one.

(2) A comparison is made between the effectiveness of the different alternatives which can be obtained within a fixed budget level. The alternative giving the highest effectiveness is preferred. If the alternatives differ both as to costs and effectiveness there is no direct logical basis for a comparison (cf. appx. 1). A common fallacy here is to minimize the cost/effectiveness ratio. By changing the measure of effectiveness to some other equally acceptable measure a different solution might, however, be obtained.

There are two general kinds of difficulties in cost-effectiveness analyses. Firstly, it might not be possible to measure the costs or the effectiveness with a uni-dimensional measure. For instance, multiple objectives will generally give rise to multi-dimensional measures of effectiveness. Similarly, it might be important to distinguish between different kinds of costs or costs payable at different times. Sometimes this makes it necessary to use multi-dimensional cost measures, sometimes a single cost measure can acceptably by obtained by including opportunity costs and by calculating the present value of costs occurring at different times for some discount rate. This "multi-dimensional" difficulty in cost-effectiveness analyses does not make this kind of analysis impossible but increases the importance of judgement in the design and the use of the studies. In Appendix 1, some ways of treating the problem are discussed.

Another difficulty in cost-effectiveness analysis arises when not all costs or not the entire effectiveness is measurable. Even in this case cost-effectiveness studies might be of value and can give rise to better choices than would otherwise have been the case (see Appendix 1).

A variety of different types of models are used in cost-effectiveness analysis. Generally speaking, the cost model (or models) translates available data for the different alternatives to the entire cost implications of adopting the alternatives. The effectiveness or performance model (or models) has a corresponding role. The complexity of the effectiveness models depends both on the problem area and the decision level. The highest decision level might be defined as the one treating major allocative decisions involving such questions as, "Should more resources be employed in national security in the future, or in health or education, etc?" However, these kinds of high level optimization decisions must be based primarily on intuition and judgement. Analysis will be helpful namely in so far as it might provide solutions to decision problems on a somewhat lower level; these solutions in turn might provide valuable information for higher level decisions. It is on these somewhat lower decision levels, technically called "suboptimization", where the analytical studies are likely to have the highest pay-off.

The determination of the optimal resource allocation on a high decision level requires the optimal resource allocations on lower levels to be known. These in turn cannot generally be determined without some knowledge of the approximate allocation on the higher level. This is illustrated by an example in Appendix 2.

The optimal allocation between programmes within a fixed budget is obtained by maximizing the overall measure of effectiveness, if such a measure can be defined and determined quantitatively. This is more likely to be the case on lower decision levels (subprogrammes). On a higher level it might be possible to estimate the effectiveness of certain marginal changes even if the total effectiveness cannot be determined. If this is the case a suggested solution can be checked by investigating if an additional money unit added to each of the programmes gives the same contribution to the overall effectiveness. This is a necessary condition for the optimum. It is, however, not a sufficient condition as some authors in this field seem to assume. This is further discussed in Appendix 2.

D. Cost-effectiveness Analysis in Long-range Planning

Planning is sometimes narrowly defined as the setting of objectives, sometimes it is used in a broader sense and covers the entire planning process. This consists of a number of different activities such as:

(1) The setting of objectives

(2) Forecasts of future environment

(3) Determination of different alternatives that can fulfil the objectives in the future environment and with consideration to existing constraints (economic and others)

(4) Determination of a preferred course of action considering the objectives, the possibilities and the constraints. This might necessitate a reformulation of the objectives.

The planning process is in its nature an iterative process. This is because the setting of objectives is a natural starting point, but at the same time has to be in part the result of the investigations of the possibilities of fulfilling the objectives. An iteration "in time" is thus required. Further, plans for complex systems involve details to a varying extent, usually corresponding to different organisational or decision levels. As an allocation of resources on a higher level requires knowledge of the "optimum" allocation on lower levels (cf. p. 42, last two paragraphs of section C, and Appendix 2), there is also a need for an iteration "in level".

For different time-spans of planning, different notations are in use.

(1) Long-range plans usually cover more than 5 or 7 years

(2) Medium-range plans cover up to 3 or 5 years

(3) Short-range plans are only concerned with the nearest year

Medium and long-range planning is sometimes called strategic planning while planning of the nearest future is called tactical planning.

When planning is used in the narrower sense as the setting of objectives, it has to be supplemented by other terms when the entire planning process is described. Thus in the United States the expression "planning - programming - budgeting" is used for the planning process involving the use of programme budgets.

The role of cost-effectiveness analysis in the programme budgeting context is discussed in the article by Gene H. Fisher in "Program Budgeting" [1] mentioned above. He distinguishes here between the following three aspects of programme budgeting:

"1. The *structural* aspects of programme budgeting are concerned with establishing a set of categories oriented primarily toward "end-product" or "end-objective" activities that are meaningful from a long-range planning point of view.

2. *Analytical process* considerations pertain to various study activities conducted as an integral part of the programme budgeting process. The primary objective of this type of analytical effort is to systematically examine alternative courses of action in terms of utility and cost, with a view to clarifying the relevant choices (and their implications) open to the decision-makers in a certain problem area.

3. *Information system* considerations are aimed at the support of the first two items."

The analytical effort is an important part of the programme budgeting idea. However, the introduction of a programme oriented budget with an extended time horizon might in some cases be an advantage even without the support of analysis as it presents more useful information to the decision makers.

Systems analysis seems to be the most wide-spread term for analysis designed to assist decision makers for long range planning problems. Its frequent use first appeared in defence planning, see for instance, "Analysis for Military Decision", edited by E.S. Quade [4]. Systems Analysis is here (p. 4) defined as an "inquiry to aid a decision-maker choose a course of action by systematically investigating his proper objectives, comparing quantitatively where possible costs, effectiveness and risks associated with the alternative policies or strategies for achieving them, and formulating additional alternatives if those examined are found wanting. Systems analysis represents an approach to, or way of looking at complex problems of choice under uncertainty".

A general description of systems analysis in a programme budgeting context is given by E.S. Quade in "Systems Analysis Techniques for Planning - Programming - Budgeting", March 1966 [5]. Here Quade points out that, "every systems analysis involves, at one stage, a comparison of alternative courses of action in terms of their costs and their effectiveness in attaining a specified objective. Such evaluations are called cost-effectiveness analyses. Since they often receive the lion's share of attention, the entire study also is frequently called a cost-effectiveness analysis, but this label puts too much emphasis on just one aspect of the decision process. In analyses designed to furnish broad policy advice other facets of the problem are of greater significance than the comparison of alternatives; the specification of sensible objectives, the determination of a satisfactory way to measure performance, the influence of considerations that cannot be quantified, or the design of better alternatives."

Fisher [1] uses, however, the term cost-effectiveness analysis in a more extended meaning than E.S. Quade does in [5]. He includes, for example, the design of new alternatives and qualitative analysis. Both authors agree, however, on the fact that most major long-range planning decision problems must ultimately be resolved primarily on the basis of intuition and judgement and suggest that the main role of analysis should be to try to sharpen this intuition and judgement.

In a Rand report on cost-effectiveness [6], E.S. Quade starts with a discussion of the difference between narrowly defined cost-effectiveness analysis and cost-effectiveness analysis more broadly defined. In the subsequent part of the paper, however, he deals more fully with broadly defined cost-effectiveness analysis, that is systems analysis in his vocabulary, and discusses its virtues and defects. Although he chooses his examples from defence planning problems, the general discussion should be relevant for educational planning problems.

The change in emphasis in recent years from short-term problems such as "finding the most efficient use of an existing system" towards long-range planning problems has somewhat changed the character of cost-effectiveness analysis. Long-range planning problems usually depend on more parameters and more data which are less easily available and often difficult to determine with any certainty. Because of the uncertainties these problems cannot always in practice, perhaps usually not, be formulated as problems of optimization. Instead the "preferred" solution is sought, i.e. the alternative that is preferred among the alternatives investigated, including the design of new systems.

As uncertainty is a major feature in most long-range planning problems, an explicit treatment of it is required in cost-effectiveness analysis. Techniques that are often used are sensitivity analysis and contingency planning.

Sensitivity analysis means an analysis of how the result depends on some parameters. These are varied within the range of uncertainty and the result is calculated for parameter values within this range or for the minimum and maximum value of the parameter. This sensitivity analysis is sometimes carried out prior to the final data collection. If the result is not sensitive to the parameter in question, less effort is required for the determination of this parameter. If on the other hand the result is sensitive to the investigated parameter variations, there are two possibilities. Either larger effort in the parameter determination might acceptably reduce the influence of remaining uncertainty on the result, or the uncertainty is "genuine" and has to be taken into account in the interpretation of the result of the cost-effectiveness analysis. This type of genuine uncertainty might for instance concern the future general environment of the system studied (for long-range plans for the educational system e.g. the number of school-age children), or the choice of objectives or measures of effectiveness. In this case the interpretation of the result might take the form of a contingency analysis. This means that the ranking of the alternatives under consideration are calculated for different "contingencies" and an alternative is sought which has a high ranking for all relevant contingencies. This might be accomplished by some kind of mix of the original alternatives or by the design of a new alternative. A hypothetical example of such a process is presented in Appendix 3.

The contingency planning approach puts the emphasis on flexible and adaptable solutions, i.e. the selection of alternatives which will be fairly efficient, perhaps after later adaption, for a variety of actual outcomes of the uncertain parameters. An example of such adaptability in educational planning is the building of schools which, for a relatively small additional cost, can be rearranged or enlarged so as to fit changes in the number of students or in the subjects taught. Increased adaptability might also be obtained for different educational sectors by reducing the time between the student's choice of more specialized general or vocational training and the time of entry in the labour force. This will create a quicker response to changes in manpower requirements. This response time can e.g. be reduced by postponing specialization or making the specialization adequate for wider occupational areas /32/.

E. Cost - Benefit Analysis

Cost-benefit analysis is a method of investigating the desirability of projects or programmes taking both different kinds of side-effects and future repercussions into account. That is, it implies the enumeration and evaluation of all the relevant costs and benefits. If these can be estimated in comparable units the term cost-benefit analysis is preferred to the term cost-effectiveness analysis.

Historically, the application of cost-benefit analysis as a basis for decisions concerning government investments was already being applied by engineers to some specific problems in the beginning of this century /10, p. 183/. During the first decades the approach was mainly analogous to the principles used by private enterprises to evaluate the profitability of capital investments. The utilization of water resources was one of the first problem areas to be examined. However, in the United States the Flood Control Act of 1936 authorised Federal participation in flood-control schemes "if the benefits to whomsoever they may accrue are in excess of the estimated costs". This wide interpretation of benefits approached cost-benefit analysis to the ideas of welfare economics. There has been a growing interest in cost-benefit analysis particularly during the last decade. The principal causes of this should be mentioned. Firstly, the scope and possibilities of quantitative analyses have increased in connection with the spread of operations research and the availability of better statistical data. Secondly, there has been in many countries an extensive growth of the public sector and consequently an increasing concern with the principles of public investment expenditures. The growing interest among economists in cost-benefit analysis in recent years can also perhaps be explained by viewing cost-benefit analysis as the quantitative technique which was previously lacking for applying some of the ideas of welfare economics in practice.

In the introduction to "Measuring Benefits of Government Investments" /1/ R. Dorfman discusses the following reasons for governmental intervention:

(1) Conditions of consumption. A collective good is a facility or service that is made freely available to all comers without user charge, either because to assess a charge on each occasion of use would be excessively cumbersome or because use is not voluntary or even clearly definable. Thus, collective goods can usually not be provided by private firms, because they do not induce a flow of income to the provider. Some important collective goods are national defence, civil and criminal justice, roads and most highways, and outdoor recreational facilities. An important feature of collective goods is thus that there are no market prices to assist in appraising their value since they are not sold. This means that there are incentives for government investments in just those areas where the benefits are difficult to measure. This fact creates serious difficulties and limitations of cost-benefit analysis.

(2) Conditions of production. The circumstances that are conducive to government initiative sometimes relate to economics of scale and the need for governmental power.

(3) Other incentives. The supposition that private investors may take an unduly short view of the consequences of their investments is an important justification for all investments having to do with the preservation of natural resources and their orderly exploitation. Society as a whole may assign quite different values to such resources than do the participants in current markets.

Sometimes government undertakings are stimulated by the desire to influence the distribution of income. Appraising the social value of such redistributions presents peculiarly difficult problems in cost-benefit analysis.

The problem of the redistribution of income is further discussed in an article by Arthur Maass /8/ where the problem is exemplified by the design of cost-benefit analysis for water-supply projects. When it is important to distinguish between benefits to different population groups, there are some different ways of designing the cost-benefit study.

(a) Maximising the benefit to some special target group subject to constraints concerning the benefits to other groups and/or to the society as a whole

(b) Maximising the entire benefits (usually measured as the increase in national income) subject to constraints concerning the benefits to different target groups

(c) Maximising the estimate of the entire benefit when shadow-prices are used for the benefits to different target groups

Calculations of Cost and Benefits

There are in use a number of slightly different formulas for comparing benefits and costs of government undertakings /p. 7, ref. 7/. The starting point of any of the formulas is the projection of the physical output of the undertaking, either in each year of its life or in some typical year of operation. Next the unit social value of each of these physical outputs have to be estimated. At this point the different formulas begin to diverge. One approach is to perform the gross benefit calculations for a typical year and to make a parallel computation for social costs in a typical year. The costs consist of two major components - current costs - the typical year expenditures for operating and maintaining the facilities; and capital costs - a charge levied against the year's operations to amortize the initial expenses of construction and installation. The ratio of gross annual benefits to total annual costs is the benefit-cost ratio.

An alternative formula subtracts current costs in each year, or in a typical year, from gross benefits to obtain an estimate of current net benefits. The current net benefits for each year are discounted back to the date of inception of the project and added up to obtain an estimate of the present value of discounted net benefits. The ratio of this figure to the estimated capital cost of the project is then the benefit-cost ratio. This formula is, therefore, analogous to a businessman's calculation of the rate of profit that can be earned by capital invested in the undertaking. A variant of this approach, an internal rate of return, which is strictly analogous with a rate of profit, may be computed. The internal rate of return, r, is implicitly defined by the equation:

$$C = \sum_{j=1}^{n} \frac{k_j}{(1+r)^j}$$

where k_j is the net benefits in year j and C equals the capital cost. The internal rate of return is thus the discount rate which makes the sum of the discounted values of the net benefits of a project during its "lifetime" n equal to its capital cost. The application of this reasoning to investments in human capital is outlined by Becker, /9, pp. 38 - 40/.

A general survey of cost-benefit analysis is provided by A.R. Prest and R. Turvey /10/. The article includes the history and scope of cost-benefit analysis, its general principles and a survey of applications in different fields. It concludes with an extensive bibliography.

Some comments could be added as to the relation between cost-effectiveness and cost-benefit analysis as defined above. The cost-benefit approach might seem more appropriate as the benefits here aim at being a direct measure of the extent to which the objectives are reached. But in several governmental activities, for instance, national defence, no such measure directly comparable to the costs can be defined. In other cases difficulties of measurement and of including intangibles limit the value of cost-benefit analysis for decision-making problems. In spite of these limitations such analysis in some problem areas might be worth the trouble and effort of the calculations if the results are correctly interpreted and considered as part of the information basis for decisions. Cost-effectiveness analysis on the other hand can probably provide a valuable basis for sub-optimizations in many fields. The extent to which such sub-optimizations contribute to overall improvements of decisions depends on how closely the measures of effectiveness chosen relate to the objectives. Here, again, cost-benefit analysis might provide, in some cases, information of value for the proper choice of measures of effectiveness.

II. EDUCATIONAL PLANNING

A. Programme Budgets in Education

The educational budgets in different countries are more or less programme oriented. In the United States President Johnson announced in August 1965 that programme budgeting was to be introduced into the entire federal establishment. In several countries programme oriented medium range plans exist. There are, however, severe difficulties as to the definition of educational programmes. This is because the educational system has several inter-related objectives, for instance

(1) Consumption benefits

(2) The creation of "human capital". In this respect education is an economic investment which produces a skilled labour force. This will contribute to economic growth and to an increase in national income.

(3) Preservation and enlargement of the body of knowledge.

(4) Political benefits

Objective (2) makes education an intermediate product, while in the other cases education probably can be considered an end-product.

However, educational objectives have to be further specified to form a basis for the definition of educational programmes. The choice of programme definitions is discussed by Werner Z. Hirsch in "Education in the Programme Budget" [Chapter 7 in ref. 1]. Here he suggests programme definitions which mainly are connected with school type and age levels. First a distinction is made between grants and loans. Then primary, secondary, higher and adult education constitute different educational programmes. The following federal sub-programmes of primary and secondary education are suggested:

(1) Across the board direct support

(2) Support in lieu of taxes

(3) Support for special groups

(4) Support for special education

(5) Indirect support

In higher education a difficulty as to programme definitions are created by the interaction between education and research.

A comprehensive treatment of the conceptual framework for the application of programme budgeting to college and university planning is presented by Harry Williams in "Planning for Effective Resource Allocation in Universities" [11]. Analytical methods for comparing different alternatives are not treated.

A further discussion of the use of programme budgeting in academic planning is presented by Paul W. Hamelman in [14]. Some possible use of cost-effectiveness analysis in this context are also outlined. The author suggests that initial cost-effectiveness work in the university sitting should centre on sub-optimization studies.

Introductory comments on programme budgeting as a tool for university planning is presented in a paper by Richard W. Judy, "Simulation and Rational Allocation in Universities [16]. The main part of the paper discusses a university simulation model CAMPUS - Comprehensive Analytical Method of Planning in the University Sphere - and the building and use of such models to provide information to university planners.

Different aspects of the use of the P.P.B.S. (Planning - Programming - Budgeting System) in education were dealt with at the Washington Conference of State Legislators in December 1966 [17, pp. 69 - 85]. Besides the Federal Government, several states in the United States are now introducing programme budgeting in education.

A general discussion of the possible use of programme budgeting on the school district level is presented by T.A. Struve and G.J. Rath in "Planning - Programming - Budgeting in Education, A Systems Approach to Capital Budgeting in School Districts" [12].

B. Cost-effectiveness Analysis in Educational Planning

The character of cost-effectiveness analysis in education varies between different types of decision problems. On "lower" decision levels where the major parameters of the educational system are not to be changed, cost-effectiveness analysis might be related to pedagogical research. In these cases possibilities of increasing the teaching effectiveness by new teaching methods or teaching aids might be studied. Often such studies vary both costs and effectiveness; for instance, they might measure the improvements attained by new equipment. If this is the case, it might be difficult to draw any conclusions from the result unless it has been possible to define such a measure of effectiveness that equal cost-effectiveness ratio implies equal efficiency. Sometimes, however, pedagogical research is designed as cost-effectiveness analysis in the sense that the results from different alternatives, all with the same cost, are compared. The other possibility in cost-effectiveness analysis, that is, to keep the effectiveness constant and try to minimize the costs, is usually more difficult in pedagogical research as the effectiveness usually cannot be determined beforehand.

Cost-effectiveness analyses are also feasible when a budget for a specific objective has been agreed on and the problem is to find the most efficient use of the money. Conceptional difficulties as to the definition of an adequate criterion for the measurement of the effectiveness might, however, occur. This is illustrated by a study on the role of education in the United States' "war on poverty" programme [31, Ch. 2], where it is shown how different "poverty" criteria can affect the relative emphasis of education in an anti-poverty programme.

Cost-effectiveness analyses in education which are concerned with such questions as e.g. suitable design and location of new school buildings are quite different from the pedagogical orientated research mentioned above. Here the other possibility in cost-effectiveness analysis, i.e. to minimize the costs for a constant effectiveness, is often appropriate. Consequently, the determination of costs is usually an important part of these types of studies. In several countries an increased effort has been made during recent years to estimate the average cost per year of study for different types of students. Depending on the purpose of these calculations the costs have sometimes only included current direct school costs, but sometimes also capital costs, teachers' training costs and scholarships. Earnings foregone by students are usually not included directly but sometimes estimated separately. Different kinds of decision problems require different kinds of cost estimates. If, for instance, a prolongation of the compulsory schooling is considered, then also earnings foregone have to be included in the social cost of the reform. For the study of changes within the educational system which keep the number of students and educational effectiveness constant (for instance alternative locations of school-buildings) the earnings foregone should be excluded. For many decision problems marginal and not average student cost is of interest. What is needed in educational planning is, therefore, not only one or a few cost estimates, but a number of cost models giving the relation between different planning alternatives and the resulting costs. These models are sometimes (not always) programmed for computers. This is usually an advantage if a large amount of data or complicated calculations are involved.

A number of different cost models are in existence or under construction in different countries. In Norway [18] for instance, cost models for different school levels have been worked out. They express the influence on the current costs of variations in the number of students, and of weekly hours for the students and for the teachers, teachers' salaries, class size and supply teacher hours.

In Denmark a cost model (programmed for a computer) forecasts the number of students in different school types and levels and calculates from this the number of different kinds of teachers needed and their total salary. The forecast period is 3 years and the resulting sum of salaries is used in the medium range budget.

An account of the use of cost models (cost analysis, budget formulas) by central authorities (states) to facilitate the budget preparation work is given by T.L. Miller in "States Budgeting for Higher Education" [15].

In most countries the educational system is expanding. A consequence of this is that a considerable part of the educational budget has to be spent on new school buildings, new training colleges for teachers and other investments. Thus cost models concerned with decision problems involving differences in capital costs have to include these capital costs in a way that makes them comparable to the current costs. This is either done by estimating the annual interest and depreciation costs of the investment or by adding all capital and current costs over a longer period of time.

Cost estimates play an important role in cost-effectiveness analysis in educational planning. This is illustrated in the paper by C.F. Carter, "The Economics of Higher Education" [19] which, among other things, gives cost estimates for different choices of university sites. As the "effectiveness" in this case for some of the different alternatives can be assumed to be the same, the paper thus gives an example of cost-effectiveness analysis. The paper also touches upon the use of incentives and the programme budgeting approach: "if universities were required to pay from their recurrent grant interest on their capital, they would have a direct reason to economise, ..., the university finance should be directly related to output by giving a general "research" grant and a teaching grant related to the numbers and types of students taught.... A university would thus have a direct incentive to think of ways of using its buildings and equipment better".

C. Cost-Benefit Analysis in Education

Cost-benefit analysis in education is usually restricted to the part of the benefit which can be considered an economic investment in the sense that it will later result in an increase in the national income. To avoid being accused of underestimating the cultural value of education, most authors [22, 24] in the field start by enumerating different objectives of education and discussing the different kinds of consumption and political benefits of education which are excluded from cost-benefit evaluations. There are several reasons for this restriction. One is the difficulty of measuring other benefits than those which can be considered as economic investments. The main reason, however, is that investment in education which increases "human capital must be taken into account in economic theories concerning economic growth as the growth of physical capital, at least as conventionally measured, has been found to explain only a relatively small part of the growth of income in most countries [20, Ch. 1]. The economic benefits of education are also important for problems concerning redistribution of income. However, the question arises how the restriction of benefits to economic benefits will influence the possibilities of using cost-benefit analyses in education for educational planning purpose. This point will be discussed further on. First, some methods and results of such analysis will be touched on as a background.

In education cost-benefit analysis usually uses the internal rate of return approach. Two different such rates have received general interest, the social and the private rate of return. The social rate of return calculations take account of the following annual costs:

(1) salaries of teachers and school administrators

(2) supplies, interest and depreciation on capital

(3) incidental school-related costs, for instance, books and travels

(4) income foregone during school attendance.

For the private rate of return (1) and (2) above are substituted by school-fees. From (4) special school-connected income "substitutes" should be detracted, such as scholarships, free school lunches, room and board, etc. The benefits are estimated from cross-section data of individuals classified by age and education. The difference between the cross-section income streams of people with varying levels of education are (partly) attributed to the difference in education levels. Before-tax figures are used for the calculation of social returns and post-tax figures as private returns.

The limitations and difficulties of this approach are discussed by several authors [21, 23, 24] and recently by Blaug [22] who specially investigates what factors give a downward or upward bias. In the following paragraphs, the use and possible misuse of the described rate of return approach for decision making problems in educational planning will be discussed.

The estimate of the future income stream by using cross-section data is correct if the observed income differences keep constant for half a century or so. It is probably a good approximation if the income differences keep fairly constant for 20 or 30 years, as the benefits in a more distant future have a rather unimportant influence on the calculated rate of return. This can be investigated by sensitivity analysis. Authors who have made use of the cross-section approach usually point out that the measured income differences have kept almost constant over a long period of years in different countries. This fact does not, however, justify the approach if it is meant to be used as a basis for decision making in educational planning. Decisions concerning the expansion of the educational system, other things being constant, will tend to diminish the income differences. That kind of decision cannot, therefore, be directly based on the assumption that these differences will remain unchanged.

Another limitation of the described rate of return approach is the difficulty in estimating to what extent the extra income is due to education alone. Income depends on other variables besides age and education, such as ability, parents' education, type of occupation and region, etc. This has been investigated by multiple regression techniques [27]. Results from the United States indicate that a larger part (the figure 60 per cent is often used) of the income increase for the average student is due to education alone. From an educational planning point of view the interesting point is, however, to what extent increased future income is due to education for the marginal student. This problem has perhaps received too little attention. Also the pure "educational" income increase probably differs between different countries depending on the percentage of students in each age group attaining different levels of schooling and on the system of selection for further studies. In countries where it is mainly costs that prevent students from continuing higher education, the income increase for the marginal student might be proportionately higher than in a country where the private costs of education are low but a selective system based on ability is an obstacle for further education.

Considering the limitations of cost-benefit analysis in education, are there decision problems for which such analyses are of value or are they only a danger? To answer this question more fully further work in the field is necessary and improvements in the data. To conclude, some possible uses will now be discussed.

The cost-benefit analyses which have been carried out in Great Britain and in the United States indicate that both the social and private rate of return of education are high in comparison with other investments. Education has, however, other objectives besides being an economic investment in human beings. This means that educational reforms which seem worth considering because of these other objectives, should undoubtedly be worthwhile if the economic rate of return for the reform considered is expected to be on the same level as for education in general.

Comparisons between the social rate of return and the private rate of return should be relevant for problems concerning the financing of education. For instance in Britain, Blaug /22/ has estimated the private rate of return from higher education (for male heads of households) to 14 per cent which considerably exceeds the social rate which has been estimated to 6.5 per cent. This large difference almost certainly is because of the large public finance of British universities which also includes scholarships for board and lodging. A conclusion of this might be that public expenditure could be reduced by changing part of the scholarships to loans to the students. Because of the high private rate of return, the students still have strong economic reasons to continue higher education.

Calculations of the private rate of return are of interest for the students' decisions concerning the choice of type and length of education and study loans.

Comparisons of the social rate of return for different types of education could be valuable for several purposes. Such calculations might, for example, be used to test hypotheses about:

(a) the efficient use of the money spent on a special type of education

(b) too high salaries because of monopolistic restrictions on entry

(c) increases or decreases in the market demand

When the extra education or training considered moves the student from a well defined salary group of the labour force to another well defined such group the economic benefits can be rather reliably estimated. Cost-benefit analysis might therefore be useful for the evaluation of re-training programmes. Such programmes sometimes primarily aim at diminishing the unemployment rate. Some examples of such cost-benefit analyses are given in /28 - 30/. A comparison and evaluation of the results of these studies has been carried out by T.I. Ribich /31, Ch. III/. Recently there has been an increasing amount of cost-benefit studies in this field.

In summary, there seems to be a number of specific problems in educational planning which could be enlightened by the use of cost-benefit analyses. In most cases sample data will be sufficient, sometimes data concerning the whole population might be an advantage. It is unlikely that cost-benefit analyses will provide any definite answers to general questions such as "Is there underinvestment or overinvestment in education?" They might, however, give valuable information concerning the economic impact of alternative policies in certain educational sectors.

APPENDIX 1

MULTI-DIMENSIONAL MEASURES OF EFFECTIVENESS

When a "system" or activity has several objectives that are partly conflicting, no uni-dimensional measure of effectiveness can be defined. If, however, the level of achievement of the different objectives has been decided upon, the alternatives achieving these levels can be compared directly by a comparison of their costs, provided there is a one-dimensional cost measure. Similarly, in case an upper cost limit as well as lower limits for all but one of the measures of effectiveness have been defined, the remaining problem is reduced to a one-dimensional comparison. If instead only a cost limit is given and the choice is between alternatives fulfilling this constraint, we get an effectiveness vector

$$\mathbf{E} = (e_1 , e_2 , \dots , e_n)$$

in the case when there are several (partly) conflicting objectives (1). There are several approaches to this problem depending on its character. Without aiming at any complete treatment of the subject we will make a few suggestions in the following for the simplest case with a two-dimensional effectiveness measure ($n=2$). The purpose is to show that, even if optimal solutions usually cannot be defined, the cost-effectiveness analyses will often even in the multi-dimensional case give rise to better solutions than would otherwise have been obtained.

We distinguish between a number of different cases.

I. One Dominant Solution

The measures of effectiveness are denoted

$$\mathbf{E}^i = (e_1^i , e_2^i)$$

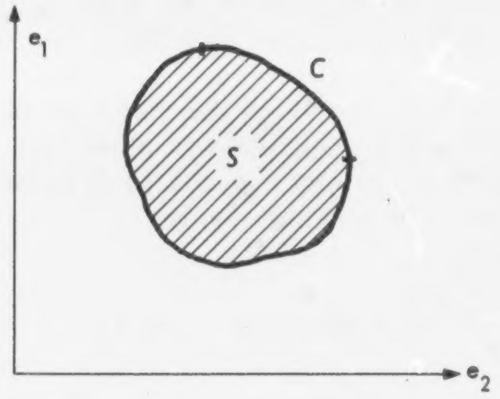
where i denotes the *ith* alternative. If there exists a j for which $e_1^j \geq e_1^i$, and $e_2^j \geq e_2^i$ for all values of i, then the alternative j is "dominant" and evidently the best solution.

---

(1) The case with varying cost can be transposed to a logically equivalent form by adding one effectiveness dimension, choosing for instance $e_{n+1} = \frac{1}{c}$ as the additional effectiveness measure (c = cost).

II. Several Dominant Solutions

Sometimes a number of the alternatives under study can be sorted out by the same method as above, that is the alternative i for which $e_1^i < e_1^j$, and $e_2^i < e_2^j$ for some j is obviously not as good a solution as the alternative j, and i can thus be left out from the final choice. This process can be illustrated by the diagram below;



The different alternatives correspond to the shaded set S which, for the purpose of illustration, here has been assumed continuous. All points in the interior of S as well as part of the contour are not as good as the points on C, which lie to the right (larger e_2 values) and above (larger e_1 values) the other points. The points on the contour C are sometimes called "efficient" solutions.

At this stage an effort to look for new and better alternatives has often a high pay-off. If alternatives with measures of effectiveness corresponding to points to the right and above points on C can be found, the choice situation is evidently improved.

Suppose there are several (or an infinite number of) efficient points, i.e. several alternatives remain after the obviously inferior ones have been sorted out by the method outlined above. Then the final solution cannot be determined without additional knowledge about the decision maker's preferences. Some assumptions as to such preferences or choice criteria will be discussed.

Preference Function

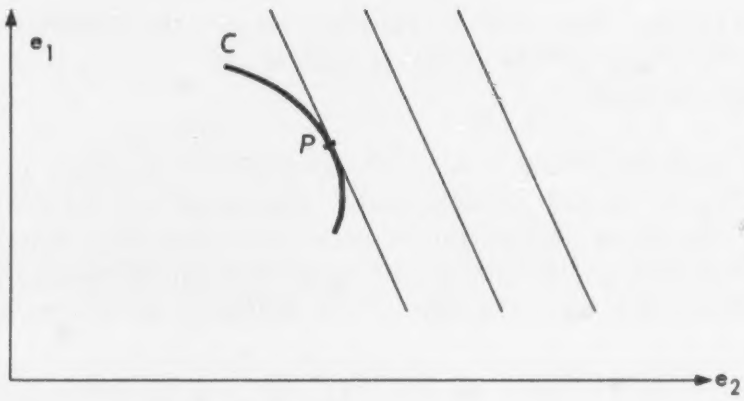
Suppose there exists a preference function $P(e_1, e_2)$ defined in such a way that the maximisation of $P(e_1, e_2)$ for the different alternatives corresponds to the optimal solution. The difficulty is to arrive at a definition of such a preference function. We distinguish between the following two cases.

(a) The decision maker has some intuitive feeling as to the importance of e_1 in relation to e_2;

(b) The function $P(e_1, e_2)$ can be estimated by studying the problem on a "higher" decision level.

Direct Estimation of the Preference Function

In the first case the decision maker might for instance always be willing to accept a decrease in e_2, Δe_2, if this gives an increase of e_1 larger than $|\mu \Delta e_2|$. This means that there exists a number of "indifference" lines with equations $e_1 + \mu e_2 + a = 0$. For alternatives corresponding to different points on such a line the decision maker is, evidently, "indifferent". Such lines are given in the diagram below together with the curve C of efficient solutions. Combinations represented on a line to the right and higher (larger e_1 and e_2 values) are preferred to combinations on a line to the left and lower.



The point of tangency, P, between the curve C and an indifference line obviously corresponds to the solution. From this point it is not possible to improve the position, that is move to a higher indifference curve, by choosing another alternative, that is by moving along C.

The preference function corresponds to the equation of the indifference lines, i.e.,

$$P(e_1, e_2) = e_1 + \mu e_2$$

For the points on the curve C it has its optimum for

$$\frac{de_1}{de_2} + \mu = 0$$

that is the point of tangency.

More generally, the indifference "lines" may be any family of curves $e_1 + \mu(e_2) + a = 0$, which corresponds to a preference function $P(e_1, e_2) = e_1 + \mu(e_2)$ with an optimal solution for $\frac{de_1}{de_2} = \frac{d\mu}{de_2}$ when certain regularity conditions are fulfilled. There is an extensive literature on the theoretical problem of finding the optimum solution when the preference function is known and when different kinds of constraints are gi In practice, however, there often is no complete knowledge of the preference func' but already some knowledge of it can diminish the number of solutions. The final choice can then be made between alternatives which are all superior to those whic have been sorted out by the analysis.

Calculations of the Preference Function from "Higher" Level Considerations

Sometimes the reason for the multiple measures of effectiveness is the level on which the problem is studied. Suppose for instance, we have the following case:

> Higher level education: Resource allocation to the Institutions of Technology for the "production" of engineers.
>
> Lower level decision: Resource allocations within the establishment. Different alternatives will influence the relative number of students in different branches (different specialities).

For the lower level problem there is a multi-dimensional measure of effectiveness corresponding to the different number of engineers "produced" on different lines. Returning to the higher level decision, this might be based on inquiries concerning shortages of engineers in certain fields or perhaps in the total number of them. In the latter case, the preference function is simply the sum of the different measures of effectiveness.

$$P(e_1, e_2, \ldots \quad) = e_1 + e_2 + \ldots e_n .$$

Choice Criteria

A choice criterion can be defined by a preference function as mentioned above. There are, however, also other approaches. Suppose there are different alternatives j with measures of effectiveness $\mathbf{E}^j = (e_1^j, e_2^j, \ldots)$. Take for example

$$\mathbf{E}^1 = (10,100)$$

$$\mathbf{E}^2 = (90,50)$$

None of these two alternatives seem interesting unless it is known that either e_1 or e_2 is of main importance. Suppose new alternatives can be found, e.g. by mixing the old ones;

$$\mathbf{E}^3 = (70,50)$$

$$\mathbf{E}^4 = (60,80)$$

A choice criterion that corresponds to a large set of different "usual" preference functions will be defined in the following. First, the e_1 and e_2 values are calculated in percentage of the maximum e_1 and e_2 values respectively. We get the following percentages:

	Number	e_1	e_2
	1	11	100
	2	100	20
	3	78	60
→	4	67	80

For each alternative the minimum of the e and e values (encircled in the table above) is looked at and the alternative having the highest minimum value is defined as the preferred one (No. 4 in this example). Generally, in the multi-dimensional case, each measure of effectiveness, being expressed in percentage of the highest measure in the same dimension, the alternative j for which $\underset{i}{\mathrm{Min}}\ e_i^j$ attains its maximum is said to be the preferred one.

This criterion might be useful when very little is known about the relative importance of the different e_i measures. It can also be used in the one-dimensional case when the measure of effectiveness takes on different values for different possible future "environments" which are not subject to the decision maker's control. In this case the choice criterion defined above is usually termed "contingency planning". This is discussed somewhat further in Appendix 3.

The same approach can also be applied when there is a difference in the non-measurable part of the effectiveness between the different "environments" (i.e. between the different columns).

APPENDIX 2

COST-EFFECTIVENESS ANALYSIS ON DIFFERENT LEVELS

As mentioned in the main text (p. 31) there is usually a strong interdependence between cost-effectiveness analyses on different decision levels. Further, a comparison of the marginal effectiveness of different programmes can be used to check if the optimal resource allocation has been found. Equal marginal effectiveness is a necessary condition for the optimum (provided the optimum is within the variation interval and not at an end point). It is, however, not a sufficient condition as

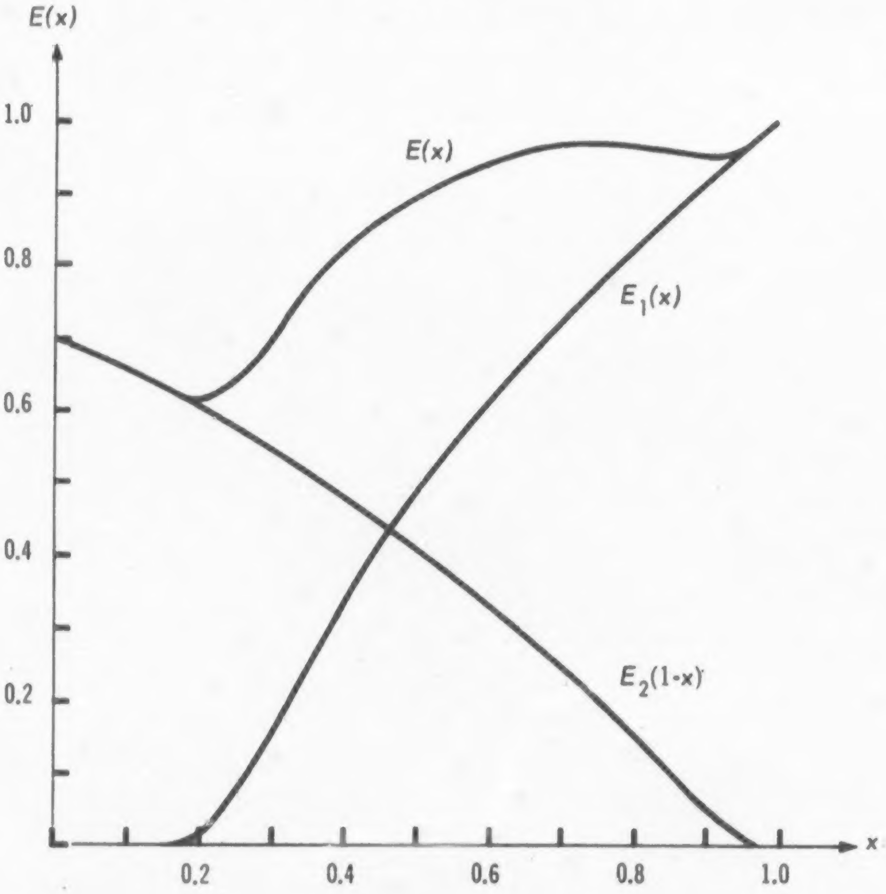
a) equal marginal effectiveness is also obtained for local minima and maxima and consequently does not imply that the total optimum has been found;

b) no definite conclusion can be based on the marginal effectiveness if the resource allocation within each of the programmes is not optimal.

These two points will be illustrated below by an example which is a schematization of an actual case study on a defence planning problem.

Suppose the allocation of resources between two programmes (weapon systems) within a fixed budget, c , is to be decided. Let $E_1(x)$ and $E_2(c-x)$ denote the measures of effectiveness for the first and second programme respectively, where x and $c - x$ is the money spent on the programmes. A numerical example is given in diagram I. To facilitate notations the total budget c has been chosen as cost unit and the effectiveness $E_1(c)$ as effectiveness unit.

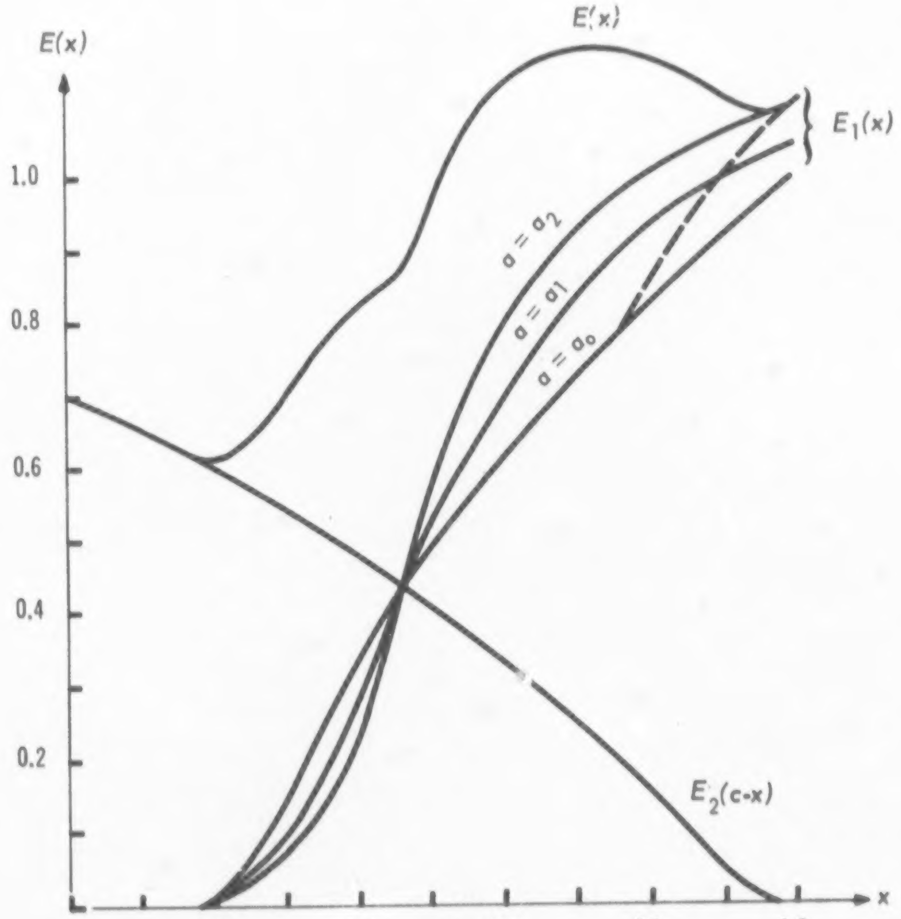
Diagram I



The optimal resource allocation between the two programmes is obtained by maximizing the overall measure of effectiveness if this can be expressed quantitatively in terms of $E_1(x)$ and $E_2(c-x)$. For the simplest case where the overall measure of effectiveness $E(x)$ equals the sum of $E_1(x)$ and $E_2(c-x)$ the function $E(x)$ is illustrated in the diagram. Equal marginal effectiveness is obtained for three different x values ($x = 0,2$; $x = 0,75$; $x = 0,92$) but these x values correspond to one local optimum and two local minima all of which are below the total optimum which is obtained for $x = 1$, i.e. the total budget should be spent on the first programme.

To illustrate the importance of a correct allocation within programmes for the allocation between programmes we now suppose that an allocation between the programmes had been based on preliminary cost and effectiveness estimates resulting in choosing $x = 0,75$ (75% of the budget to the first and 25% to the second programme). When more accurate estimates are available the allocation problem is reconsidered. The first programme has two main components, the parameter a reflecting the allocation between these components. The choice of a can thus be termed a lower level allocation. The leader of the first programme can now argue as follows. The new cost estimates show that money for one of the two components is "lacking". If more money could be obtained from the second programme and put on this component this would give a considerable effectiveness increase and a much higher marginal effectiveness than the second programme has for $0,75 \leq x \leq 1$. Consequently, the money previously allocated to the second programme should be transferred to the first programme. The fallacy of this reasoning is illustrated by the diagram below. The effectiveness of the first programme is denoted by $E_1(x,a)$, where a can be varied between a_0 and a_2. The value a_0 corresponds to the original allocation between the two components of the programme. The functions $E_1(x, a_0)$, $E_1(x, a_1)$ and $E_1(x, a_2)$ are drawn in the diagram.

Diagram II



The dotted line for x between 0,75 and 1 corresponds to the "argumentation line" mentioned above according to which an increase of x from 0,75 to 0,9 would make it possible to change a_0 to a_1 and a further increase to $x = 1$ would change a_1 to a_2. The slope of this function is quite high and exceeds the slope of $E_2(c-x)$. However, even with an unchanged allocation between the programmes the internal allocation could be improved by changing a_0 to a_2. To find the total optimum it is the function $E_1(x, a_2)$ and not $E_1(x, a_0)$ which should be considered for $x > 0,5$. For the total effectiveness $E(x)$ we get:

$$E(x) = E_1(x, \imath_2) + E_2(1 - x) \quad \text{for } 0,5 \leq x \leq 1$$

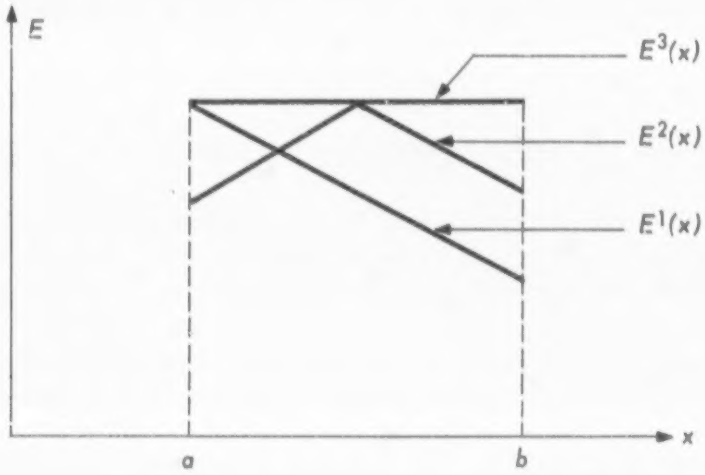
$$E(x) = E_1(x, \imath_0) + E_2(1 - x) \quad \text{for } 0 \leq x \leq 0,5$$

It follows from the diagram that the total optimum is obtained for $x \sim 0,72$. Consequently, there is no reason to allocate additional money to the first programme, i.e. to increase x above 0,75. Theoretically x should be decreased to 0,72. In practice this might not be worth while as the optimum is very flat and changes from previous decisions sometimes cause different kinds of "intangible" costs.

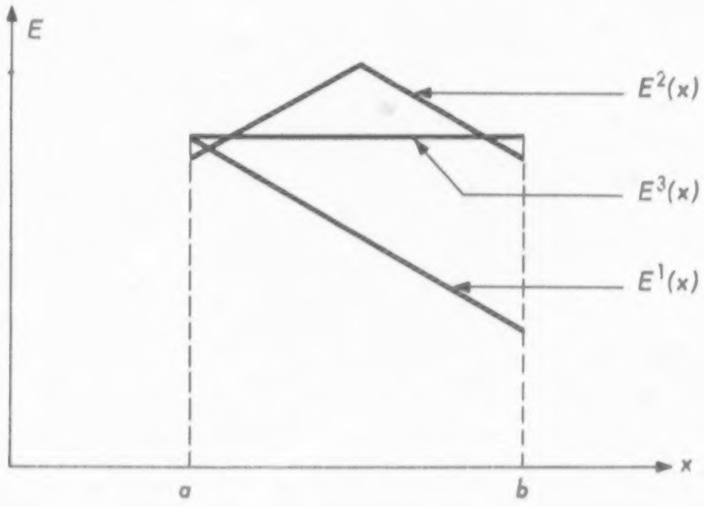
APPENDIX 3

CONTINGENCY PLANNING

Suppose a measure of effectiveness has been defined and estimated and that there is one main source of uncertainty, for instance the number x of students (in the educational system or in a certain district or school under consideration). Let the effectiveness $E^n(x)$ be given according to the diagram below, where n denotes the different system design alternatives within a given budgetary frame (i.e. different school sizes) and x has a range of uncertainty between a and b.



In this case we have $E^3(x) \geqslant E^2(x)$ and $E^3(x) \geqslant E^1(x)$ for all x-values of interest. It is thus evident that the 3rd alternative, $E^3(x)$ is the best and that this result is not sensitive to the uncertainty in x. Suppose, however, that the effectiveness function looks somewhat differently.



In this case the solution depends on the knowledge of the probability distribution of x. If it is very probable that x will be in the neighbourhood of a or b, $E^3(x)$ might be the preferred solution. This preference depends of course on the probability of x differing from a and b such that $E^3(x) \leq E^2(x)$ and the willingness of taking the corresponding risk. If, however, nothing is known about the probability distribution of x, if the uncertainty in x is genuine, then the second alternative, $E^2(x)$ is chosen as it for no value of x gives a measure of effectiveness which is considerably below the maximum effectiveness value. This rule of choice is usually termed contingency planning. For the example presented, it can be given a more precise definition as follows:

> Choose the alternative N for which $E^N(x)$ exceeds for each x-value a certain percentage p, with p as high as possible, of the other effectiveness values corresponding to the same x-value, i.e. choose the x-value for which
>
> $$E^N(x) \geqslant p \cdot E^n(x)$$
>
> for all x and n and for highest possible p-value.

In the case of several uncertain factors analogous decision rules can be formulated. Sometimes the uncertain factor x only takes on discrete values. Even in this case the same formulation of the rule of choice can be supplied.

There are a number of variants of the decision rule given above, i.e. instead of comparisons involving a certain percentage of the maximum value, a certain fixed decrease in the maximum value might be considered. The most reasonable choice of decision rule depends of course on the problem under consideration.

The type of decision rules given above are termed contingency planning when the uncertain parameter x corresponds to such future environments of the system under study which are not under the decision-maker's control. The same kind of decision rules can, however, be applied in other cases, i.e. when there is an uncertainty as to what measure of effectiveness should be applied or when there is a multi-dimensional measure of effectiveness. (cf. Appendix 1)

BIBLIOGRAPHY

Programme Budgeting and Cost-Effectiveness Analysis in General

1. David Novick (editor), "Program Budgeting: Program Analysis and the Federal Budget", Harvard University Press, Cambridge, Massachusetts, 1965. (Reviewed in J. ORSA, 1966, p. 173-177.)

2. Gene H. Fisher, "The World of Program Budgeting", the Rand Corporation, P - 3361, May 1966.

3. Robert N. Grosse, "An Introduction to Cost-effectiveness Analysis", RAC Paper, RAC - P - 5, published July 1965.

4. E.S. Quade (editor), "An Appreciation of Analysis for Military Decision".

5. E.S. Quade, "Systems Analysis Techniques for Planning - Programming - Budgeting", March 1966. The Rand Corporation, P - 3322.

6. E.S. Quade, "Cost-effectiveness: An Introduction and Overview", The Rand Corporation, May 1965, pp. 31-34.

7. Robert Dorfman (editor), "Measuring Benefits of Government Investments", The Brookings Institution, Princeton University Press, 1965.

8. Maass, A. "Benefit-Cost Analysis. Its Relevance to Public Investment Decisions". Quart. Jour. Econ., May 1966, 80(2) Harvard University U.S.A. (Reviewed in the Journal of Economic Abstracts, Vol. IV, Number 4, p. 618.)

Cost-benefit Analysis in General

9. Gary S. Becker, "Human Capital", Columbia University Press, New York and London, 1964.

10. A.R. Prest and R. Turvey, "Cost Benefit Analysis, A Survey", Economic Journal, December 1965.

Educational Planning - Programme Budgeting

11. Harry Williams: "Planning for Effectiveness Resource Allocation in Universities", American Council of Education, Washington, D.C., 1966.

12. T.A. Struve and G.J. Rath: "Planning-Programming-Budgeting in Education, A Systems Approach to Capital Budgeting in School Districts", Educational Technology, 15th June, 1966.

13. Elaine Exton: "The Word from Washington", American School Board Journal (November 1966) pp. 39-43.

14. Paul W. Hamelman, "Academic Planning With Program Budgeting", presented at the Cost Effectiveness Section IV, Thirty-Second National meeting of the Operations Research Society of America, 3rd November, 1967.

15. Miller, James L. Jr. "State Budgeting for Higher Education", Publication of the Institute of Public Administration Ann Arbor: University of Michigan, 1964.

16. Richard W. Judy, "Simulation and Rational Resource Allocation in Universities", O.E.C.D. DAS/EID/67.7.

17. Proceedings of the National Conference of State Legislators, Washington, D.C. - 4th-6th December, 1966.

Cost-effectiveness Analysis

18. Planleggnings sekretariatet, Kirke - og Undervisnings departementet, Norway:
Notat 15/6-64 KE/ki, "Forelopig utkast til modell for driftskostnader i barneskolen"
Notat 8/3-66 KEi/ki,"Kostnadsutviklingen i folkeskolen Driftskostnadene"
Notat 2/5-1967 KEi/fle, "Utviklingen av driftskostnader og laererbehov i gymnasiet og verksteds skolen fram til 1985".

19. C.F. Carter, "The Economics of Higher Education", The Manchester School of Economic and Social Studies, January 1965.

Cost-benefit Analysis in Education

20. G. Becker, "Human Capital. A Theoretical and Empirical Analysis with special reference to Education", Columbia University Press, New York and London, 1964.

21. T. Schulz, "The Economic Value of Education", Columbia University Press, New York and London, 1964.

22. M. Blaug, "The Rate of Return on Investment in Education in Great Britain", The Manchester School of Economic and Social Studies, September 1965.

23. Burton A. Weisbrod, "External Benefits of Public Education, An Economic Analysis", Princeton University, 1964.

24. Burton A. Weisbrod, "Investing in Human Capital", The Journal of Human Resources, Vol. I, Nr. 1, Summer 1966.

25. Hirsch, Werner and Morton Marcus, "Some Benefit-Cost Considerations of Universal Junior College Education", National Taxation Journal XIX, March 1966, pp. 19-48.

26. W.L. Hansen, "Total and Private Rates of Return to Investment in Schooling", Journal of Political Economy, Vol. LXXI, April 1963.

27. S.J. Hunt, "Income Determinants for College Graduates and The Return to Educational Investment", Yale Economic Essays, Fall 1963.

28. M.E. Borus, "A Benefit-Cost Analysis of the Economic Effectiveness of Retraining the Unemployed", Yale Economic Essays, Vol. 4, No. 2, Fall 1964.

29. D.A. Page, "Retraining Under the Manpower Development Act: A Cost-Benefit Analysis", Public Policy, Vol. 13 (1964).

30. G.G. Somers and E.W. Stromsdo~~e~~rfer, "A Benefit-Cost Analysis of Manpower Retraining", Industrial Relations Research Association Proceedings (December 1964).

31. T.I. Ribich, "Education and Poverty", Economic Studies Division, The Brookings Institution, Washington, D.C. September 1966.

32. M. Blaug, "Approaches to Educational Planning", The Economic Journal, June 1967.

INTRODUCTION A LA PROGRAMMATION BUDGÉTAIRE ET A L'ANALYSE COÛT-EFFICACITÉ DANS LA PLANIFICATION DE L'ENSEIGNEMENT

par Brita Schwarz

Au cours des dernières années, on s'est livré à des études sur les nouvelles techniques de gestion, telles que la programmation budgétaire et l'analyse coût-efficacité, qui ont été appliquées, dans une certaine mesure, dans différents secteurs sociaux. Dans une première partie, nous chercherons à définir quelques termes nouveaux désormais d'un usage courant dans ce domaine. Puis, nous nous entretiendrons des principes généraux concernant l'application de ces techniques nouvelles à la planification de l'enseignement. Nous nous référerons à certains documents récemment parus et traitant de ce sujet.

I. DEFINITIONS GENERALES

A. La programmation budgétaire

La signification du terme "programmation budgétaire" varie quelque peu suivant le domaine auquel il s'applique. Cependant, il suppose une répartition des activités considérées en "programmes" ou catégories tendant vers un objectif final et une présentation de leurs coûts en harmonie avec ces programmes. Pour donner quelques examples, disons simplement que l'instruction primaire, la prolongation d'un an de l'instruction scolaire obligatoire, les repas scolaires, pourraient constituer des programmes. Les coûts et bénéfices afférents à un programme couvrent généralement plusieurs années. C'est pourquoi un laps de temps plus long que dans le budget annuel courant est habituellement nécessaire pour permettre aux bénéfices d'un programme de l'emporter sur son coût. Ce problème de la période est une caractéristique importante du concept de programmation budgétaire (1).

En plus de la comptabilisation des programmes avec un étalement dans le temps assez long pour en permettre l'étude approfondie, le concept de programmation budgétaire couvre fréquemment aussi des applications de formes diverses de l'analyse coût-efficacité ou coût-bénéfice. Les analyses de ce type ont pour but d'examiner les différentes actions possibles en termes de bénéfices et de coûts afin de faire ressortir les options opportunes qui s'offrent à celui qui prend la décision.

Il est évident que la manière dont le budget étale les dépenses proposées varie suivant les pays. Bien souvent la structure budgétaire a été, à l'origine, prévue dans le but de faciliter l'exécution administrative et la vérification des comptes. Cependant, on pourrait également prévoir un budget qui faciliterait par exemple la décision en matière de répartition des ressources. L'importance croissante de cette tâche budgétaire a attiré récemment l'attention sur la nécessité de trouver de nouvelles méthodes de rapport financier. En reconsidérant la procédure budgétaire de telle sorte que le budget fasse ressortir la répartition des ressources non seulement à court terme mais encore à long terme, le budget peut améliorer la coordination des planifications à long et à court terme.

Dans de nombreux pays, le même plan budgétaire sert à la fois les objectifs de décision et d'exécution. Il est cependant possible d'employer pour chacun de ces deux buts une structure budgétaire différente, à condition toutefois qu'un transfert puisse s'opérer facilement de l'un à l'autre. Ce genre de "transfert" peut être rendu aisé par l'emploi d'ordinateurs. La structure budgétaire la plus appropriée à l'exécution administrative et à la vérification comptable est en générale découpée par inputs, c'est-à-dire orientée vers l'achat d'articles définis. Ainsi, le budget de l'éducation se trouve réparti en différentes imputations scolaires, bâtiments scolaires, etc.
Le budget d'un programme est, au contraire, plus "extérieur", orienté vers un but final, avec une division des coûts par exemple, entre les différents niveaux scolaires, les différents groupes bénéficiaires, etc. Ainsi, en ce qui concerne les universités, on différencie les coûts attribués à l'enseignement et à la recherche.

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(1) Le terme anglais "programme budgeting" est ici traduit par programmation budgétaire ou budget par programme, quelquefois aussi budget ou budgétisation programmé (e).

Il semblerait que la première utilisation, sur une grande échelle, de la programmation budgétaire par un gouvernement date de 1962, année où elle a été introduite dans le Département de la Défense, aux Etats-Unis. Afin d'en étendre l'application à d'autres domaines, on a fait paraître un certain nombre d'articles exposant des idées générales sur la programmation budgétaire. Ainsi, "Program Budgeting" [1] édité par D. Novick, contient quelques chapitres d'introduction traitant de la théorie de base de la programmation budgétaire. Dans le Premier Chapitre, Melvin Anshen traite du "Budget fédéral : instrument d'administration et d'analyse".

Au Chapitre 2, Arthur Smithies donne la "Structure conceptuelle de la programmation budgétaire" et le Chapitre 3 est un article de Gene H. Fischer sur "Le rôle de l'analyse coût-utilité dans la programmation budgétaire". Un certain nombre de documents de la Société Rand, écrits par ces mêmes auteurs contient des études analogues sur ce sujet, par exemple "The World of Program Budgeting" par G.H. Fischer [2].

On comprend aisément que la répartition des différents systèmes et activités devant supporter les coûts, conformément aux programmes liés à l'objectif final, est un travail logique, difficile, parfois même impossible. Les définitions des programmes en vigueur dans le Département américain de la Défense peuvent parfaitement illustrer ce fait. L'une des principales raisons de la réforme budgétaire de 1961 fut le poids décroissant de la séparation traditionnelle des différentes "Armes" dans l'exécution des missions ou programmes essentiels. En 1958, au moment où la Marine Nationale avait développé le système Polaris, en tant que système stratégique de dissuasion, il devait, en ce qui concerne les ressources, entrer dans le cadre du budget de la Marine, en compétition avec les autres systèmes, au même titre que la protection des convois militaires ou le transport des troupes. Cependant, le système Polaris servant apparemment le même but que certains systèmes de l'Armée de Terre (missiles basés au sol) et de l'Armée de l'Air, l'attribution de ressources au système Polaris devait logiquement se faire, non plus dans le cadre du budget de la Marine, mais dans celui d'un programme général de dissuasion stratégique. Ce problème a été résolu par la réforme budgétaire de 1961 - 1962 qui a introduit un programme spécial pour les Forces stratégiques de Représailles. Les autres programmes de Défense étaient les suivants :

1. Défense continentale
2. Forces Armées d'Utilité générale
3. Ponts aérien et maritime
4. Recherche et Développement
5. Forces de Surveillance générale et nationale
6. Soutien général
7. Assistance militaire
8. Défense civile

Les chiffres figurant entre crochets reportent à la bibliographie figurant à la fin de ce document.

Comme l'un des objectifs des Forces de Défense continentale est de protéger et d'avertir les forces stratégiques, celles-ci peuvent être considérer comme un élément de dissuasion stratégique. Il existe, cependant, d'autres raisons de les traiter comme un programme séparé.

Les ponts aérien et maritime dont le rôle est d'accroître la mobilité des Forces Armées d'Utilité générale pourraient être traités comme un élément de ce programme. Pourtant ils forment un programme séparé parce qu'on doit considérer les composants, pont aérien et pont maritime, comme des éléments interchangeables et que la combinaison la meilleure doit être obtenue.

Les exemples donnés ci-dessus démontrent qu'en dépit des avantages offerts sur le système précédent par la division en programmes de défense, aucun budget de programme complet n'a été établi, en théorie, ni ne peut logiquement l'être. Dans le même ordre d'idée, un autre problème intéressant est celui des relations existant entre les objectifs de la défense et ceux de la politique étrangère. Ainsi, l'assistance militaire et l'assistance non militaire des Etats-Unis aux autres pays ont probablement, dans certains cas, des objectifs étroitement liés qui doivent être exprimés dans les définitions des programmes.

Il y a de fortes chances pour que les problèmes logiques auxquels on se heurte dans la définition des programmes surgissent également dans d'autres domaines d'application. Ceci provient de ce que les éléments supportant les coûts ne peuvent que très rarement être répartis en programmes nettement séparés, de telle sorte qu'il y ait une correspondance univoque entre chaque programme et chaque objectif. En conclusion, on peut pas dire, habituellement, qu'un budget est ou n'est pas un budget par programme mais plutôt qu'il est dans une proportion plus ou moins grande un budget par programme.

B. Les incitations

L'un des avantages du système de la programmation budgétaire réside dans l'accroissement des possibilités de décentralisation et de création de stimulants de l'efficacité. Si les imputations sont orientées vers un objectif et non vers le programme, la responsabilité du programme doit demeurer à l'échelon le plus élevé de l'organisation. Il est cependant difficile de trouver un mode de répartition efficace des ressources dans le cadre d'un programme à cet échelon, par suite du manque d'information. Il est plus aisé d'obtenir l'information détaillée, habituellement nécessaire, aux échelons inférieurs de décision. Mais, fréquemment, ceux qui ont le pouvoir de prendre ces décisions ne sont pas incités à trouver et à proposer le mode de répartition des ressources le plus efficace, s'ils savent que les imputations sont plus aisément approuvées pour certains inputs que pour d'autres. Lorsque, par exemple, le même objectif ou le même degré d'efficacité peut être atteint, à un moindre coût, avec moins de professeurs et plus de moyens d'enseignement ou d'investissements dans les constructions scolaires, on ne ressent pas la nécessité de proposer une telle modification si les imputations concernant les salaires sont plus facilement approuvées. Le cloisonnement des imputations conformément aux programmes et peut-être une subdivision des programmes en sous-programmes et éléments de programme, sur décision des responsables de chaque programme, (et éventuellement de chaque sous-programme), incite à rechercher et à proposer (ou décider) la meilleure répartition des ressources dans le cadre du programme. On pourrait encore citer quelques exemples d'incitations. Ainsi, si le traitement alloué par l'état à un chef d'agence, ou au directeur d'une école locale, est en corrélation étroite avec les dépenses courantes de l'agence, cet état de fait incite aux dépenses. Par contre, si le traitement est lié de façon absolue au rendement par coût unitaire on aboutit à une incitation à l'efficacité.

Lorsque l'Etat peut disposer de fonds pour certaines catégories d'inputs nécessaires à l'accomplissement d'un programme local et non pour tous les inputs, il s'ensuit, pour les autorités locales, une incitation à engager des dépenses sur les inputs financés par l'Etat. Si les autorités locales ont le pouvoir de décision réel, on peut arriver à stimuler l'efficacité en rendant les fonds gouvernementaux disponibles pour tous les articles de dépenses prévus pour le programme, mais, en faisant en même temps, financer une part considérable du programme par les autorités locales. L'essentiel est de formuler des règles de financement telles que les autorités ayant le pouvoir réel de décision répartissent les ressources dans le cadre d'un programme comme si le budget total pour le programme était fixé et aucune ressource "libre" disponible. On aboutit également à ce résultat dans le cas où l'Etat verse une subvention fixe pour un programme déterminé. Dans l'organisation de la défense, aux Etats-Unis, on a introduit une stimulation à l'économie en demandant aux autorités ayant le pouvoir de décision de faire un compte rendu sur les économies réalisées sur les dépenses annuelles déjà approuvées. Ces économies sont alors reportées sur d'autres dépenses concernant la défense.

Les stimulants liés aux contrats d'industrie, par exemple, pour la construction de bâtiments scolaires, constituent une autre catégorie. Dans l'hypothèse où le contrat stipule que la rémunération versée à l'industrie en cause doit être égale aux dépenses de cette industrie augmentées d'un pourcentage déterminé, il en résulte pour l'industrie une incitation à dépenser le plus possible afin d'accroître par là-même le gain. On peut cependant prévoir des contrats ayant pour but de stimuler l'économie : ainsi, par exemple, une partie de la différence entre une somme fixée à l'avance et les coûts réels connus lorsque le travail est achevé, est payée ou gagnée par l'industrie. Si la somme fixée à l'origine est trop élevée, l'industrie reçoit une part du gain, si elle est trop faible, elle verse une partie de la perte.

Une modification de la structure budgétaire dans le sens d'un budget orienté vers un programme déterminé n'aboutit pas automatiquement à l'accroissement de la décentralisation ni à l'amélioration des incitations à l'efficacité. Le contraire peut très bien se produire si ces possibilités n'ont pas été soigneusement étudiées. Une centralisation accrue peut provoquer la suppression des options bien que l'un des objectifs du budget de programme soit d'aider les fonctionnaires dans le sondage systématique des différentes solutions. Cependant, l'introduction d'un système de programmation budgétaire peut entraîner dans la structure de la prise de décision, les modifications nécessaires pour garantir que les sous-optimations du niveau inférieur sont, autant que faire se peut, en harmonie avec l'optimation du niveau supérieur. Dans le cas d'une organisation déjà bien décentralisée, ceci peut signifier une décentralisation plus accentée dans certains domaines et moins dans certains autres.

On peut illustrer le problème de la centralisation par l'exemple des Etats-Unis où l'enseignement est, avant tout, sous la responsabilité des Etats et de l'administration locale. Si l'on se réfère, par exemple, au Département américain du Budget /̄17, p. 70_7, cette situation demeurera, après l'entrée en vigueur du PPBS (Système de la Planification et de la Programmation Budgétaire). Pourtant, c'est à tort que l'on a prétendu qu'il impliquait un accroissement de la centralisation, ainsi qu'il découle de l'article de E. Exton "Word from Washington, Federal Program Budgeting is a step toward Centralized Education Planning" [13]. L'auteur s'interroge également sur l'objectivité du système. Cependant, dans le domaine de l'enseignement, la détermination des objectifs doit toujours être une question de politique.

Les problèmes concernant l'exécution et l'application d'un budget de programme sont étudiés dans la Troisième Partie de l'ouvrage sur la programmation budgétaire "Program Budgeting" [1] déjà cité. Il contient des articles de Roland N. McKean et Melvin Anshen sur insuffisances, risques et difficultés de la programmation budgétaire ; de George A. Steiner, sur les problèmes d'exécution et de Melvin Anshen sur l'application concrète du budget de programme, au moment où il est pleinement entré en vigueur.

C. Analyse coût-efficacité

Il est courant d'employer un certain nombre de termes dont la signification est analogue, par exemple coût-efficacité, coût-utilité et coût-bénéfice. Le terme analyse coût-bénéfice fréquemment utilisé, depuis quelques années, dans la théorie économique, l'est surtout lorsque le "bénéfice" d'un projet donné peut se mesurer en unités directement comparables à ses coûts, c'est-à-dire, en règle générale, en unités monétaires. Dans cette hypothèse, on calcule le rapport bénéfice/coût qui sert de base aux décisions relatives à la rentabilité du projet.

Lorsque le bénéfice d'un projet ou d'un programme ne peut être calculé ou estimé en unités monétaires - ce qui est souvent le cas pour les activités gouvernementales - on utilise un autre procédé qui consiste à définir une mesure pouvant servir à déterminer l'efficacité ou l'utilité, et qui se rattache à l'objectif de l'activité envisagée. L'analyse coûts-efficacité peut alors prendre l'une des deux formes suivantes :

(1) On établit une comparaison entre les coûts des différentes solutions dont l'efficacité est de même mesure, c'est-à-dire répondant, dans la même proportion, à un objectif donné. On considère alors la solution la moins onéreuse comme la meilleure.

(2) On établit une comparaison entre l'efficacité des différentes solutions auxquelles on peut aboutir dans le cadre d'un niveau budgétaire déterminé. La solution garantissant l'efficacité la plus élevée aura la préférence. Si les solutions diffèrent tant par les coûts que par l'efficacité, aucune base logique et directe de comparaison ne peut exister (cf. Annexe 1). Une erreur courante consiste à minimiser le rapport coût/efficacité. En remplaçant la mesure de l'efficacité par quelque autre tout aussi acceptable, on peut cependant obtenir une solution différente.

Des difficultés de deux sortes surgissent dans les analyses coût-efficacité. D'abord il n'est peut-être pas possible de mesurer les coûts ou l'efficacité au moyen d'une mesure à une dimension. Par exemple, un grand nombre d'objectifs vont, en règle générale, donner naissance à des mesures d'efficacité à plusieurs dimensions. De même, il peut être important de faire une distinction entre les différentes catégories de coûts ou de coûts payables à divers moments. Tantôt ceci rend nécessaire l'usage de mesures de coûts "multi-dimensionnelles", tantôt on peut, de façon acceptable, obtenir une seule mesure de coût, en incluant les coûts d'opportunité et les calculs relatifs à la valeur actuelle des coûts échelonnés dans le temps, pour un taux d'escompte donné. Cette difficulté "multi-dimensionnelle" des analyses coût-efficacité ne les rend pas impossibles mais donne de l' importance au rôle du jugement dans la conception et l'emploi des études. L'Annexe 1 présente quelques méthodes pour traiter ce problème.

Une autre difficulté surgit dans l'analyse coût-efficacité lorsqu'on ne peut pas mesurer tous les coûts, ou l'efficacité totale. Même dans ce cas, les études sur le coût-efficacité peuvent être d'une grande valeur et permettre de choisir des solutions plus valables que celles auxquelles on aurait pu aboutir autrement (voir Annexe 1).

On utilise, dans l'analyse coût-efficacité, différents types de modèles. En règle générale, le modèle (ou les modèles) de coût transforme les données existantes pour les différentes solutions en coût global pour l'adoption de ces solutions. Le modèle (ou les modèles) d'efficacité joue un rôle similaire. La complexité des modèles d'efficacité dépend à la fois du domaine dans lequel se place le problème et du niveau auquel se prend la décision. Le niveau le plus élevé peut se définir comme celui où l'on prend les décisions portant sur les répartitions essentielles et traitant de questions telles que "doit-on employer plus de ressources dans les années à venir, pour la sécurité nationale, ou la santé ou l'enseignement ?". Cependant, on est obligé de fonder les décisions d'optimation à l'échelon supérieur, principalement sur l'intuition et le jugement. L'analyse sera utile dans la mesure où elle peut apporter des solutions aux problèmes de décision à un échelon un peu moins élevé ; ces solutions, à leur tour, sont susceptibles de fournir une information valable pour les décisions à l'échelon supérieur. C'est à ces échelons légèrement inférieurs de décision - que l'on nomme techniquement sous-optimations - que les études analytiques ont le plus de chances d'être rentables.

La détermination de la répartition optimale des ressources à un niveau supérieur de décision exige une connaissance des répartitions optimales aux niveaux inférieurs. Celles-ci, de leur côté, ne peuvent généralement être définies sans une certaine connaissance de la répartition approximative à l'échelon supérieur. A l'Annexe 2, un exemple vient illustrer ces faits.

Dans le cadre d'un budget déterminé, la répartition optimale entre les programmes s'obtient en maximisant la mesure totale de l'efficacité, à condition toutefois que cette mesure puisse être définie et déterminée quantitativement. Ceci est plus vraisemblablement le cas pour les niveaux inférieurs de décision (sous-programmes). A un niveau élevé, il peut être possible d'évaluer certaines modifications marginales même si l'on ne peut pas déterminer l'efficacité totale. Dans ce cas, une proposition de solution peut être contrôlée en recherchant si une unité monétaire additionnelle ajoutée à chacun des programmes apporterait la même contribution à l'efficacité totale. C'est une condition nécessaire pour parvenir à un résultat optimal mais ce n'est pas une condition suffisante comme certains auteurs semblent l'admettre. Ce problème est traité dans l'Annexe 2.

D. L'analyse coût-efficacité dans la planification à long terme

La planification est définie tantôt de façon étroite comme la détermination des objectifs, tantôt dans un sens plus large et elle couvre alors l'ensemble du processus de planification. Ce processus comporte un certain nombre d'activités diverses telles que :

(1) La détermination des objectifs à atteindre ;

(2) Les prévisions sur l'environnement futur ;

(3) La détermination des solutions diverses pouvant répondre aux objectifs dans l'environnement futur, compte tenu des contraintes existantes (économiques et autres) ;

(4) La détermination de la ligne de conduite jugée idéale compte tenu des objectifs, des possibilités et des contraintes. Ceci peut entraîner une formulation nouvelle des objectifs.

Le processus de planification est, par sa nature même, un processus itératif. Ceci provient de ce que la détermination des objectifs constitue un point de départ naturel en même temps qu'elle doit être en partie le résultat des recherches sur les possibilités de répondre aux divers objectifs. C'est pourquoi, une itération "en temps" est nécessaire. De plus, les projets portant sur des systèmes complexes nécessitent un plus ou moins grand nombre de détails, correspondant habituellement aux différents stades de l'organisation et de la décision. La répartition des ressources à un niveau supérieur exigeant une connaissance de la répartition optimum aux niveaux inférieurs (cf. les deux derniers paragraphes de la page 62 et Annexe II).

On utilise des notations diverses pour les différentes durées de planification :

(1) Les plans à long terme couvrent habituellement plus de 5 à 7 années ;

(2) Les plans à moyen terme jusqu'à 3 à 5 années ;

(3) Les plans à court terme ne concernent que l'année la plus proche.

Les planifications à moyen terme et à long terme sont parfois appelées planifications stratégiques, et la planification portant sur l'avenir le plus proche, planification tactique.

Si la planification est employée dans son sens le plus étroit de détermination des objectifs, on doit compléter par d'autres termes lorsqu'on décrit le processus complet de planification. Ainsi, aux Etats-Unis, on utilise l'expression "planification programmation budgétaire" pour parler du processus de planification comportant l'usage des budgets par programme.

Le rôle de l'analyse coût-efficacité dans le contexte de la programmation budgétaire est étudié dans un article de Gene H. Fischer paru dans "Program Budgeting" [1], ouvrage déjà cité. Il y fait une distinction entre les trois aspects suivants de la programmation budgétaire :

"(1) L'aspect structural dont l'objet est de déterminer une série de catégories, orientées essentiellement dans le sens d'activités tendant vers un "produit final" ou un "objectif final", tout à fait significatives d'une planification à long terme.

(2) Les aspects du procédé analytique se rattachent aux différentes activités de recherche menées en tant que partie intégrante du processus de programmation budgétaire. L'objectif principal de ce type d'effort analytique est l'examen systématique des diverses alternatives en termes d'utilité et de coût, afin de faire ressortir les options pertinentes (et leurs implications) qui s'offrent aux décideurs, dans le cadre d'un problème particulier.

(3) Les aspects du système d'information dont le but est de soutenir les deux premiers aspects."

L'effort analytique représente une part importante du concept de programmation budgétaire. Cependant, l'introduction d'un budget structuré suivant les programmes sur une période plus étendue, peut, dans certains cas, constituer un avantage, même sans le soutien de l'analyse, puisqu'il offre une information plus utile aux décideurs.

L'analyse des systèmes semble être l'expression la plus répandue pour désigner une analyse destinée à aider les autorités chargées de la décision dans les problèmes de planification à long terme. Son usage courant, est apparu, pour la première fois, dans la planification de la défense (voir à titre d'exemple "Analysis for Military Decision", édité par E.S. Quade [4]). L'analyse des systèmes y est définie (p. 4) comme "une enquête destinée à aider le décideur à choisir une ligne de conduite en examinant systématiquement ses propres objectifs, en comparant quantitativement, dans la mesure du possible, les coûts, l'efficacité et les risques liés aux différentes politiques et stratégies employées pour y parvenir et en formulant des solutions additionnelles, dans le cas où celles examinées seraient jugées insuffisantes. L'analyse des systèmes représente une méthode ou un moyen de considérer des problèmes complexes de choix dans l'incertain".

Une description générale de l'analyse des systèmes dans le contexte d'une programmation budgétaire est donnée par E.S. Quade dans "Systems Analysis Techniques for Planning-Programming-Budgeting" de mars 1966 [5]. Quade y fait remarquer que "toute analyse de systèmes comporte, à un stade déterminé, une comparaison des différentes stratégies en termes de coûts et de l'efficacité, dans la poursuite d'un objectif précis. On nomme ces évaluations analyses coût-efficacité. Comme on leur porte souvent la plus grande part d'attention, l'ensemble de l'étude est fréquemment appelé analyse coût-efficacité mais cette dénomination insiste trop sur un seul aspect du processus de décision. Dans les analyses destinées à fournir des avis précis sur la conduite à adopter, il existe d'autres aspects du problème dont la signification est plus importante que la comparaison des options : spécification des objectifs raisonnables, détermination d'une méthode satisfaisante permettant de mesurer le rendement, influence de considérations qui ne peuvent être quantifiées ou formulation d'options plus favorables".

Fischer [1] emploie, pourtant, l'expression analyse coût-efficacité dans un sens plus large que E.S. Quade ne le fait [5]. Ainsi, il inclut le projet de nouvelles solutions et d'analyse qualitative. Les deux auteurs s'accordent, cependant, sur le fait que la plupart des problèmes essentiels de décision portant sur la planification à long terme sont, en fin de compte, inévitablement résolus, avant tout, sur la base de l'intuition et du jugement ; ils suggèrent que le rôle principal de l'analyse consiste à essayer d'aiguiser cette intuition et ce jugement.

Dans un rapport de la Rand sur le coût-efficacité [6], E.S. Quade entame un débat sur la différence entre l'analyse coût-efficacité dans son sens restreint et dans son sens le plus large. Dans la suite de l'article, cependant, il traite de façon plus complète l'analyse coût-efficacité dans sa définition large, c'est-à-dire, selon sa conception personnelle, l'analyse des systèmes, et il étudie ses qualités et ses faiblesses. Bien qu'il choisisse ses exemples parmi les problèmes de planification de la défense, l'ensemble du débat peut s'appliquer au domaine de la planification de l'enseignement.

Le fait que depuis une période récente on insiste davantage sur les problèmes de planification à long terme que sur ceux à court terme - tels que "la recherche de l'emploi le plus efficace d'un système existant" - a quelque peu modifié le caractère de l'analyse coût-efficacité. Les problèmes de planification à long terme dépendent habituellement d'un plus grand nombre de paramètres et de données, moins aisément accessibles et souvent difficiles à déterminer avec certitude. A cause des incertitudes qu'ils comportent, ces problèmes, en pratique, ne peuvent pas toujours - et souvent pas du tout - être formulés comme des problèmes d'optimation. A la place, on recherche la solution "préférée", c'est-à-dire l'option que l'on juge préférable parmi celles que l'on a étudiées, y compris le projet de systèmes nouveaux.

L'incertitude étant une caractéristique essentielle de la plupart des problèmes de planification, à long terme, il est nécessaire dans les analyses coût-efficacité d'y apporter un traitement précis. Les techniques qui sont généralement utilisées sont l'*analyse de sensibilité* ou la *planification de l'éventualité*.

L'analyse de sensibilité montre le degré de dépendance entre résultat et certains paramètres. Ceux-ci varient à l'intérieur de la zone d'incertitude et le résultat se calcule pour les valeurs du paramètre situées à l'intérieur de cette zone ou pour les valeurs minimales et maximales du paramètre. Parfois, on effectue cette analyse de sensibilité avant d'avoir rassemblé les données précises. Si le résultat n'est pas sensible au paramètre en question un effort moindre est nécessaire pour déterminer la valeur exacte de ce paramètre. Par contre, si le résultat est sensible aux variations du paramètre étudié, il existe deux possibilités : ou bien un effort plus grand dans la détermination du paramètre peut réduire de façon acceptable l'influence de l'incertitude restante sur le résultat, ou bien l'incertitude est "irréductible" et doit être prise en considération dans l'interprétation du résultat de l'analyse coût-efficacité. Ce type d'incertitude irréductible peut, par exemple, influencer l'environnement futur du système étudié (dans les projets à long terme du système de l'enseignement, par exemple, le nombre des enfants d'âge scolaire) ou le choix des objectifs ou les mesures de l'efficacité. Dans cette hypothèse, l'interprétation du résultat peut prendre la forme d'une analyse d'éventualité. Ceci signifie que la classification des options prises en considération se calcule pour différentes "éventualités" et que la solution recherchée doit être celle qui, pour toutes les éventualités, est située aux rangs élevés de la classification. On peut obtenir ce résultat soit au moyen d'amalgame de solutions de base, soit par un projet d'option nouvelle. Un exemple hypothétique de ce procédé est donné dans l'Annexe 3.

La méthode de la planification de l'éventualité insiste sur des solutions souples et adaptables, telles que le choix d'options qui seront réellement efficaces, peut-être après adaptation ultérieure, pour une gamme des réalisations des paramètres aléatoires. Un exemple de cette adaptabilité dans la planification de l'enseignement réside dans la construction d'écoles qui peut, à un coût additionnel relativement faible, subir une remise en ordre ou être développée suffisamment pour s'adapter au nombre des étudiants ou aux matières enseignées. On peut également aboutir à une adaptabilité croissante dans divers secteurs de l'enseignement en réduisant la période qui s'écoule entre le moment où l'étudiant choisit un enseignement général ou professionnel plus spécialisé et celui de son entrée dans le monde du travail. Ceci pourra fournir une réponse plus rapide en ce qui concerne l'évolution des besoins de main-d'oeuvre. Ce temps de réponse peut, par exemple, être réduit en différant la spécialisation ou en la rendant suffisante pour des domaines professionnels plus vastes /̅32̲7.

E. Analyse coût-bénéfice

L'analyse coût-bénéfice est une méthode qui consiste à rechercher le caractère souhaitable de tels projets ou programmes en tenant compte à la fois des différentes catégories d'effets secondaires et de répercussions futures. Cela suppose l'énumération et l'évaluation de tous les coûts et bénéfices entrant en ligne de compte. Si l'on peut les évaluer en unités comparables, l'expression analyse coût-bénéfice est préférable à l'analyse coût-efficacité.

Historiquement, l'analyse coût-bénéfice, comme base des décisions relatives aux investissements de l'Etat, était déjà utilisée au début de ce siècle par les ingénieurs pour résoudre certains problèmes particuliers /̅10, p. 183̲7. Au cours des premières décades, la méthode présentait de nombreuses analogies avec les principes adoptées par les entreprises privées pour l'évaluation de la rentabilité des investissements en capital. Le problème de l'utilisation des ressources aquatiques fut l'un des premiers à être étudiés. Cependant, aux Etats-Unis, le Flood Control Act de 1936 a autorisé la participation fédérale dans les projets de contrôle des eaux "si les bénéfices, à qui que ce soit qu'ils puissent échoir, excèdent les coûts estimés". Cette interprétation large de la notion de bénéfices rapprochait l'analyse coût-bénéfice des concepts de l'économie de bien-être. On a montré un intérêt croissant pour l'analyse coût-bénéfice tout particulièrement durant la dernière décade. Les principales raisons de ce fait doivent être mentionnées. En premier lieu, la portée et les possibilités des analyses quantitatives ont augmenté parallèlement au développement de la recherche opérationnelle et à l'accessibilité croissante des données statistiques ; en second lieu, de nombreux pays ont vu se produire un développement considérable du secteur public et, par suite, un intérêt croissant pour les principes régissant les dépenses d'investissement public. Il est possible aussi que l'intérêt accru porté, au cours des dernières années, par les économistes à l'analyse coût-bénéfice puisse s'expliquer par le fait que l'on voit en elle la technique quantitative qui manquait auparavant dans l'application pratique de certains concepts de la politique de bien-être.

Dans son introduction à l'ouvrage "Measuring Benefits of Government Investments /̲7̲/̲, R. Dorfman étudie les raisons suivantes de l'intervention gouvernementale :

(1) Conditions liées à la consommation. Un bien collectif représente une facilité ou un service mis librement à la portée de tous, sans charge d'utilisation, soit parce qu'une taxation à l'occasion de chaque usage serait excessivement malhabile, soit parce que son emploi n'est pas volontaire ou même clairement définissable. Ainsi, les biens collectifs ne peuvent habituellement pas être fournis par des sociétés privées parce qu'ils ne procurent pas une abondante source de revenus au fournisseur. Parmi les biens collectifs les plus importants, citons la défense nationale, la justice civile et criminelle, les routes et la plupart des autoroutes ainsi que les facilités offertes dans le domaine des loisirs de plein air. L'une des caractéristiques principales des biens collectifs réside dans le fait qu'il n'y a aucun prix de marché qui permette d'estimer leur valeur puisqu'ils ne sont pas vendus. Ceci signifie qu'il existe, précisément dans ces domaines où les bénéfices ne se mesurent que difficilement, des incitations aux placements d'Etat. Ce fait entraîne de sérieuses difficultés et restrictions de l'analyse coût-bénéfice.

(2) Conditions liées à la production. Les circonstances favorables à l'initiative gouvernementale sont liées parfois aux économies d'échelle et au besoin d'autorité gouvernementale.

(3) Autres incitations. L'hypothèse que les épargnants privés se font une idée très incomplète des conséquences de leurs placements justifie pleinement tous les investissements se rapportant à la préservation des ressources naturelles et à leur exploitation méthodique. La société, dans son ensemble, peut attribuer à ces ressources des valeurs totalement différentes de celles que lui attribuent les participants aux marchés courants.

Les initiatives gouvernementales sont quelquefois stimulées par le désir d'influer sur la répartition du revenu. L'appréciation de la valeur sociale de telles redistributions pose des problèmes particulièrement complexes dans l'analyse coût-bénéfice.

Le problème de la redistribution du revenu est traité de façon approfondie dans un article d'Arthur Maass /̲8̲/̲ où il est illustré par le schéma de l'analyse coût-bénéfice dans les projets d'approvisionnement en eau. Lorsqu'il s'avère important de faire une distinction entre les bénéfices attribués aux différents groupes de population, on peut schématiser l'étude coût-bénéfice de plusieurs manières :

(a) en maximisant le bénéfice attribué à un certain groupe bénéficiaire, objet de contraintes en ce qui concerne les bénéfices attribués aux autres groupes et/ou à l'ensemble de la société,

(b) en maximisant l'ensemble des bénéfices (calculé habituellement comme l'accroissement du revenu national), objets de contraintes en ce qui concerne les bénéfices des différents groupes,

(c) en maximisant l'estimation du bénéfice global lorsqu'on utilise des prix duaux pour les bénéfices attribués aux différents groupes-clés.

Calcul du coût et des bénéfices

Un certain nombre de formules légèrement différentes sont d'usage courant pour établir la comparaison des bénéfices et des coûts des initiatives gouvernementales [p. 7 ref. 7]. Le point de départ de toute formule est la projection de la production matérielle du projet, soit pour chaque année de son existence, soit pour une année caractéristique de son exécution. Puis, on doit évaluer la valeur sociale unitaire de chacune de ces productions matérielles. A ce stade, des divergences commencent à apparaître entre les différentes formules. L'une des formules employées consiste à calculer le bénéfice brut pour une année caractéristique et à évaluer parallèlement les coûts sociaux au cours d'une année caractéristique. Il existe deux catégories essentielles de coûts - les coûts courants ou dépenses effectuées au cours d'une année caractéristique pour l'exécution et l'entretien des facilités - et les coûts du capital - un montant prélevé sur les opérations de l'année pour l'amortissement des dépenses initiales de construction et d'installation. La proportion de bénéfices bruts annuels par rapport au total des coûts annuels représente le rapport bénéfice/coût.

Une autre formule consiste à soustraire, pour chaque année ou pour une année caractéristique, les coûts courants des bénéfices bruts afin d'obtenir une estimation des bénéfices courants nets. Les bénéfices courants nets de chaque année sont actualisés sur la date du début du projet et sommés pour obtenir une estimation de la valeur actuelle des bénéfices nets escomptés. Le rapport de ce chiffre à l'estimation du coût du capital représente le rapport bénéfice/coût. Cette formule est, par conséquent, analogue au calcul qu'effectuerait un homme d'affaires pour déterminer le taux d'intérêt que peut lui rapporter le capital qu'il a investi dans le projet. On peut calculer une variante de cette méthode, le taux de rendement interne, analogue à un taux d'intérêt. Le taux de rendement interne " r " est défini de façon implicite par l'équation :

$$C = \sum_{j=1}^{n} \frac{k_j}{(1+r)^j}$$

dans laquelle k_j représente les bénéfices nets au cours de l'année j et C égale le coût du capital. Le taux de rendement interne est donc le taux d'escompte qui rend la somme des valeurs escomptées des bénéfices nets d'un projet, au cours de son "existence" n , égale à son coût de capital. Becker souligne l'application de ce raisonnement aux investissements en capital humain [9, pp. 38 à 40].

A.R. Prest et R. Turvey [10] donnent un aperçu général de l'analyse coût-bénéfice. Leur article comporte un historique de l'analyse, il traite de sa portée, des principes généraux qui la régissent et donne un aperçu de ses applications dans divers domaines. Il se termine par une vaste bibliographie.

On doit apporter quelques explications complémentaires en ce qui concerne le rapport entre l'analyse coût-efficacité et l'analyse coût-bénéfice telles qu'elles ont été définies ci-dessus. La méthode coût-bénéfice dans laquelle les bénéfices tendent à être une évaluation directe de la mesure dans laquelle les objectifs sont atteints pourrait paraître plus appropriée. Pourtant, dans plusieurs activités gouvernementales telles que la défense nationale, on ne peut définir aucune mesure directement comparable aux coûts. Dans d'autres cas, les difficultés rencontrées pour mesurer et pour inclure des éléments non quantifiables limitent la valeur de l'analyse coût-bénéfice pour les problèmes de décision. Malgré ces limitations cette analyse peut, dans certains types de problèmes, mériter la peine et les efforts fournis pour effectuer ses calculs, si les résultats sont correctement interprétés et considérés comme une partie de l'information nécessaire pour prendre les décisions. En outre, il est probable que l'analyse coût-efficacité puisse fournir, dans de nombreux secteurs, une base précieuse aux sous-optimations. La mesure dans laquelle ces sous-optimations contribuent à l'ensemble des améliorations apportées aux décisions, dépendent de la façon plus ou moins étroite par laquelle les mesures d'efficacité choisies sont liées aux objectifs. Ici encore, l'analyse coût-bénéfice pourrait fournir, dans certains cas, une information de valeur pour effectuer un choix judicieux des mesures d'efficacité.

II. PLANIFICATION DE L'ENSEIGNEMENT

A. La programmation budgétaire dans l'enseignement

Dans divers pays, les budgets d'enseignement sont plus ou moins structurés suivant des programmes. Aux Etats-Unis, le Président Johnson a annoncé en août 1965 qu'on allait introduire la programmation budgétaire dans l'ensemble de l'administration fédérale. Il existe dans certains pays des plans à moyen terme structurés suivant des programmes. Cependant, on rencontre de sérieures difficultés quant à la définition des programmes d'enseignement, du fait que le système d'éducation comporte plusieurs objectifs liés entre eux, par exemple :

(1) les bénéfices de consommation ;

(2) la création du "capital humain". A cet égard, l'éducation est un investissement économique produisant une force de travail spécialisée. Ceci contribuera à la croissance économique et à l'accroissement du revenu national ;

(3) la préservation et l'élargissement de l'ensemble des connaissances ;

(4) les avantages politiques.

L'objectif (2) fait de l'enseignement un produit intermédiaire, alors que dans les autres cas on peut, vraisemblablement, le considérer comme un produit final.

Cependant il est nécessaire de préciser davantage les objectifs de l'enseignement pour constituer une base à la définition des programmes d'enseignement. La question du choix de telles définitions est traitée dans "Education in the Programme Budget" (Chapitre 7, ref. I) par Werner Z. Hirsch qui propose des définitions de programme ayant trait essentiellement aux différents types d'établissements scolaires et niveaux d'âges de la scolarité. Une première distinction est opérée entre les subventions et les prêts. Ensuite différents programmes représentent les enseignements primaire, secondaire, supérieur ainsi que l'enseignement destiné aux adultes. A l'échelon fédéral, les sous-programmes suivants sont proposés pour les enseignements primaire et secondaire :

(1) Soutien direct et général

(2) Soutien destiné à compenser les impositions

(3) Soutien en faveur de groupes spéciaux

(4) Soutien en faveur d'un enseignement particulier

(5) Soutien indirect.

L'enseignement supérieur pose un problème en ce qui concerne les définitions des programmes par suite de l'interpénétration de l'enseignement et de la recherche.

Dans son ouvrage "Planning for Effective Resource Allocation in Universities" [11], Harry Williams traite de la structure conceptuelle de l'application de la programmation budgétaire dans la planification de l'enseignement au niveau des "colleges" et dans des universités ; ne sont pas étudiées les méthodes analytiques de comparaison des différentes options.

Une autre étude de l'emploi de la programmation budgétaire dans la planification universitaire est présentée par Paul W. Hamelman [14]. Quelques-uns des usages possibles de l'analyse coût-efficacité dans ce domaine y sont également esquissés. L'auteur suggère que les analyses coût-efficacité des problèmes universitaires doivent dans un premier temps se centrer sur les problèmes de sous-optimation.

Dans l'introduction "Simulation and Rational Allocation in Universities" [16], Richard W. Judy présente des observations sur la programmation budgétaire utilisée comme instrument de la planification universitaire. L'essentiel de l'article est consacré à un modèle universitaire de simulation, CAMPUS (Comprehense Analytical Method of Planning in the University Sphere), à la construction et à l'emploi de tels modèles pour fournir les renseignements nécessaires à la planification universitaire.

Différents aspects de l'emploi du PPBS (Planning Programming - Budgeting System) dans l'enseignement furent traités lors de la conférence des législateurs gouvernementaux qui s'est tenue à Washington en décembre 1966 [17, pp. 69 - 85]. Outre le gouvernement fédéral, plusieurs Etats des Etats-Unis introduisent actuellement la programmation budgétaire dans l'enseignement.

T.A. Struve et G.J. Rath dans "Planning - Programming - Budgeting in School Districts" [12], présentent un exposé général portant sur la possibilité d'employer la programmation budgétaire au niveau du secteur scolaire.

B. Analyse coût-efficacité dans la planification de l'enseignement

L'analyse coût-efficacité dans le domaine de l'enseignement présente un caractère variable selon la catégorie dans laquelle se situent les problèmes de décision. Aux niveaux inférieurs de décision, où les principaux paramètres du système d'enseignement n'ont pas à être modifiés, l'analyse peut être liée à la recherche pédagogique. Dans les cas de cette espèce on peut étudier les possibilités d'accroître l'efficacité de l'enseignement au moyen de méthodes nouvelles ou avec des moyens d'enseignement. Il est fréquent que de telles études modifient à la fois les coûts et l'efficacité ; elles peuvent, par exemple, mesurer les améliorations obtenues grâce à un nouvel équipement. Si c'est le cas, il peut ne pas être aisé de tirer des conclusions du résultat, à moins que l'on ait pu définir une mesure d'efficacité telle que des rapports coût-efficacité égaux implique une rentabilité équivalente. Parfois, cependant, la recherche pédagogique est conçue comme une analyse coût-efficacité en ce sens que les résultats des différentes solutions, ayant le même coût, sont comparés. L'autre éventualité de l'analyse coût-efficacité, c'est-à-dire celle qui consiste à garder l'efficacité constante et à essayer de minimiser les coûts, est, d'ordinaire, plus difficile dans le domaine de la recherche pédagogique, l'efficacité ne pouvant habituellement pas être déterminée à l'avance.

Les analyses coût-efficacité sont également possibles lorsqu'un budget portant sur un objectif précis a été accepté ; le problème est alors de trouver l'usage le plus efficace des fonds. Il pourrait cependant s'avérer difficile de concevoir la définition d'un critère approprié pour l'évaluation de l'efficacité. On en trouve l'illustration dans une étude sur le rôle de l'enseignement dans le programme américain de "lutte contre la pauvreté /¯31, Chapitre 2_7, où l'on montre comment divers critères de "pauvreté"peuvent influer sur l'importance relative de l'enseignement dans un programme "anti-pauvreté".

Les analyses coût-efficacité du domaine de l'enseignement, qui ont trait à des problèmes tels que la conception et l'emplacement de nouvelles constructions scolaires diffèrent totalement de la recherche pédagogique orientée dont il a été question ci-dessus. Ici, c'est l'autre éventualité de l'analyse coût-efficacité - c'est-à-dire minimiser les coûts tout en conservant une efficacité constante - qui se révèle fréquemment opportune. Par suite, la détermination des coûts tient habituellement une part importante dans les études de ce type. Plusieurs pays ont fourni un effort croissant, au cours des dernières années, afin d'évaluer le coût moyen par année d'études pour les différentes catégories d'étudiants. Selon le but de ces calculs, les coûts englobent quelquefois les seuls coûts scolaires courants, directs, mais quelquefois aussi le coût des investissements, celui de la formation des professeurs et des bourses d'études. Le manque à gagner des étudiants n'est, d'ordinaire, pas inclus directement mais parfois estimé séparément. Les modes d'estimation des coûts varient selon le type de problème de décision dont il s'agit. Si, par exemple, on prend le cas d'un accroissement de la durée de la scolarité, il sera alors nécessaire d'inclure le manque à gagner des étudiants dans le coût social de la réforme. Par contre, dans les études de modifications du système d'enseignement, où l'on garde le nombre d'étudiants et l'efficacité de l'enseignement constants (par exemple, emplacements différents des constructions scolaires); ces gains doivent être exclus. Dans de nombreux problèmes de décision, ce n'est pas le coût moyen par étudiant mais le coût marginal qui est intéressant. Ce qui est nécessaire dans la planification de l'enseignement c'est, par conséquent, non seulement une ou plusieurs estimations de coûts mais un certain nombre de modèles de coût donnant le rapport entre les différentes options de planification et les coûts en résultant. Ces modèles sont parfois (pas toujours) programmés pour des ordinateurs. C'est habituellement un avantage lorsqu'on se trouve en présence d'un nombre considérable de données ou de calculs complexes.

Un certain nombre de modèles de coûts différents existent ou sont en cours de préparation dans divers pays. En Norvège /¯18_7 par exemple, des modèles de coûts ont été mis au point pour les différents niveaux scolaires. Ils traduisent l'influence, sur les coûts habituels, des variations du nombre des étudiants, du nombre d'heures hebdomadaires d'enseignement relatives aux professeurs et aux étudiants, des traitements des enseignants, de la dimension des classes et des heures de suppléants.

Au Danemark, un modèle de coûts (programmé pour ordinateur) prévoit le nombre d'étudiants dans les divers types et niveaux scolaires et calcule à partir de là, le nombre de catégories différentes d'enseignants dont on a besoin ainsi que leur traitement global. La période prévue est de 3 ans et le montant des traitements qui en résulte est utilisé dans le budget à moyen terme.

Un exposé de l'emploi des modèles de coût (analyse de coût, formules de budget) par les autorités centrales (Etats), pour faciliter le travail de préparation du budget, est donné par T.C. Miller dans "State Budgeting for Higher Education" /_15_7.

Dans la plupart des pays, le système d'enseignement est en expansion. L'une des conséquences de ce fait est qu'une part considérable du budget de l'éducation doit être dépensée pour la construction de nouvelles écoles, de nouveaux collèges d'enseignement pour la formation des enseignants et pour divers autres investissements. Ainsi, les modèles de décision impliquant des différences entre les coûts de l'investissement doivent inclure ces coûts de manière à ce que l'on puisse les comparer aux coûts courants. On y arrive, soit par l'évaluation de l'intérêt annuel et des coûts d'amortissement de l'investissement, soit par addition de l'ensemble des coûts du capital et des coûts courants, durant un laps de temps plus long.

Dans le domaine de la planification de l'enseignement, ces évaluations de coûts jouent un rôle important dans l'analyse coût-efficacité. L'article de C.F. Carter "the Economics of Higher Education" /_19_7 qui, entre autres choses, donne des évaluations de coût pour différents choix d'emplacements pour les universités, illustre parfaitement ce point. Comme on peut supposer, dans cette hypothèse, que l'efficacité est la même pour un certain nombre de solutions, l'article donne un exemple d'analyse coût-efficacité. Il traite aussi de la question de l'utilisation des stimulants et de la méthode de la programmation budgétaire : "Si l'on faisait verser aux universités, à partir de leurs subventions périodiques, un intérêt sur leur capital, elles auraient une raison directe d'économiser ..." Les finances d'une université pourraient être directement liées à sa production par l'allocation d'une subvention générale à la recherche et d'une autre à l'enseignement, en fonction du nombre et des catégories d'étudiants qu'on y forme ... Une université serait ainsi directement incitée à chercher le moyen d'utiliser au mieux ses bâtiments et son équipement.

C. L'analyse coût-bénéfice dans l'enseignement

L'analyse coût-bénéfice dans l'enseignement se limite habituellement à la part de bénéfices que l'on peut considérer comme un investissement économique en ce sens qu'elle aboutira ultérieurement à un accroissement du revenu national. De crainte qu'on ne les accuse de sous-estimer la valeur culturelle de l'enseignement, la plupart des auteurs /_22, 24_7 commencent par énumérer les différents objectifs de l'enseignement et exposer les diverses catégories de bénéfices de consommation et d'avantages politiques que l'on exclut des évaluations coût-bénéfice. Cette restriction a plusieurs raisons. L'une d'elles est la difficulté de mesurer les bénéfices autres que ceux que l'on peut considérer comme des investissements économiques. Cependant, la raison essentielle réside dans le fait qu'il est nécessaire, dans les théories relatives à la croissance économique, de tenir compte de l'investissement dans l'enseignement qui accroît le capital humain ; on a, en effet, estimé que le développement du capital physique, au moins lorsqu'il est mesuré de façon conventionnelle, ne justifiait qu'une part relativement faible de l'augmentation du revenu dans la plupart des pays /_20, Chapitre 1_7. Les bénéfices économiques de l'enseignement sont importants également dans les problèmes concernant la redistribution du revenu.

Cependant, on peut se demander comment le fait de limiter les bénéfices aux bénéfices économiques peut influer sur les possibilités d'emploi des analyses coût-bénéfice lorsqu'on a pour but la planification de l'enseignement. Cette question sera traitée plus loin. D'abord, nous étudierons quelques méthodes et résultats de telles analyses.

En matière d'enseignement, l'analyse coût-bénéfice utilise, de façon habituelle, le taux de rendement interne. Deux taux de rendement interne différents sont pris en considération, le taux de rendement social et le taux privé. Dans le calcul du taux social, on tient compte des coûts annuels suivants :

(1) traitements des enseignants et des administrateurs scolaires ;

(2) fournitures, intérêts et amortissement du capital ;

(3) frais accessoires d'ordre scolaire tels que livres et ramassage scolaire ;

(4) manque à gagner pendant la scolarité.

Dans le calcul du taux privé, les rubriques (1) et (2) ci-dessus sont remplacées par les frais de scolarité. De la rubrique (4) on doit déduire certains "substituts" de revenus à caractère scolaire tels que les bourses détudes, les repas scolaires gratuits, la pensions, etc. On évalue les bénéfices à partir de données classés par âge et par niveau d'instruction à un instant donné. On attribue (partiellement) aux différences dans les niveaux d'enseignement, les écarts entre les courants de revenu par tranche d'une population dont les niveaux d'instruction sont variables. On se sert des revenus avant imposition pour le calcul des bénéfices sociaux et après imposition pour les bénéfices privés.

Plusieurs auteurs /̅21, 23, 24_7 traitent des limitations et des difficultés de cette méthode et récemment Blaug /̅22_7 examine particulièrement les facteurs qui donnent une distorsion par excès ou par défaut. Dans les paragraphes qui suivent nous abordons le problème de l'usage et, éventuellement, du mauvais usage, de cette méthode du taux de rendement pour la prise de décision dans la planification de l'enseignement.

L'évaluation des revenus futurs en utilisant l'information à un instant donné est correcte à condition que les écarts de revenu observés demeurent constants pendant un demi-siècle environ. Il est probable que le résultat sera valable si les écarts de revenu sont pratiquement constants pendant 20 ou 30 ans puisque les bénéfices dans un avenir plus lointain, n'ont qu'une influence assez faible sur le taux de rendement. On peut examiner ceci au moyen d'une analyse de sensibilité. Les auteurs qui ont recours à la méthode expliquée précédemment font habituellement remarquer que les écarts de revenu mesurés sont demeurés à peu près constants pendant de nombreuses années dans divers pays. Cependant, ce fait ne saurait justifier l'emploi de cette méthode, si elle est destinée à servir de base à l'élaboration d'une décision concernant la planification de l'enseignement. Les décisions portant sur l'expansion du système d'enseignement, toutes choses égales par ailleurs, tendra à réduire les écarts de revenu. On ne peut pas, par conséquent, baser directement ces décisions sur la supposition que ces écarts ne changeront pas.

Une autre limitation de la méthode du taux de rendement réside dans la difficulté de déterminer jusqu'à quel point le revenu additionnel provient exclusivement de l'enseignement. Le revenu dépend d'autres facteurs variables, en dehors de l'âge et de l'instruction, tels que la compétence, l'instruction des parents, le genre de profession, le type de région, etc. De nombreuses techniques de régression ont examiné ce point /̅27̲7. Aux Etats-Unis, les résultats indique que, pour un étudiant moyen la plus grande partie (le chiffre de 60 % est fréquemment mentionné) de l'accroissement de son revenu est la conséquence exclusive de son instruction. Cependant, du point de vue de la planification de l'enseignement, la question intéressante est de savoir dans quelle mesure l'accroissement du revenu futur de étudiant marginal est le résultat de l'enseignement qu'il a reçu. Peut-être n'a-t-on pas prêté assez d'attention à ce problème. L'accroissement de revenu purement issu de l'éducation varie probablement suivant le pays considéré, selon le pourcentage d'étudiants de chaque groupe d'âge atteignant divers niveaux de scolarité et selon le système de sélection pour les hautes études. Dans les pays où ce sont essentiellement les coûts qui empêchent les étudiants de poursuivre des études universitaires, l'accroissement du revenu pour l'étudiant marginal pourrait être proportionnellement plus élevé que dans un pays où les coûts privés de l'enseignement sont faibles, mais où un système sélectif basé sur la capacité constitue un obstacle à un enseignement plus poussé.

Si l'on tient compte des limitations de l'analyse coût-bénéfice dans l'enseignement, existe-t-il des problèmes de décision pour lesquels ces analyses sont valables ou bien constituent-elles seulement un danger ? Pour répondre de façon plus complète à cette question, il est nécessaire d'étudier ce domaine de façon plus approfondie et d'apporter des améliorations dans les données. Pour terminer, nous traiterons des utilisations possibles de l'analyse.

Les analyses coût-bénéfice qui ont été effectuées en Grande-Bretagne et aux Etats-Unis montrent que le taux social et le taux privé de rendement, dans l'enseignement, sont tous deux élevés par rapport aux autres investissements. En dehors du fait qu'il est un investissement humain économique, l'enseignement a, cependant, d'autres objectifs. Ceci signifie que les réformes de l'enseignement qui semblent dignes d'intérêt grâce à ces autres objectifs, doivent incontestablement être acceptés si le taux de rendement, pour la réforme considérée, est supposé au même niveau que pour l'enseignement en général.

Les comparaisons entre le taux social et le taux privé de rendement doivent concerner les problèmes relatifs au financement de l'enseignement. Ainsi, pour la Grande-Bretagne, Blaug /̅22̲7 a estimé à 14 % le taux privé de rendement dans l'enseignement supérieur (pour les chefs de famille de sexe masculin), ce qui excède largement le taux social évalué à 6,5 % . Cet écart considérable est à peu près certainement dû au vaste financement public des universités britanniques qui comprend également les bourses pour la pension. Il en résulte, entre autres, qu'on pourrait réduire les dépenses publiques en transformant une partie des bourses d'études en prêts aux étudiants. En raison du taux de rendement privé élevé, les étudiants ont encore de fortes raisons économiques de poursuivre des études supérieures.

Les calculs du taux privé de rendement sont intéressants pour les décisions des étudiants concernant le choix du type et de la durée de l'enseignement et celui de leurs emprunts.

Des comparaisons du taux social de rendement pour différents modes d'enseignement pourraient être précieuses pour plusieurs objectifs. On pourrait les utiliser par exemple pour analyser diverses hypothèses concernant :

(a) l'emploi efficace des fonds engagés pour un mode particulier d'enseignement ;

(b) le montant trop élevé des salaires par suite de restrictions d'ordre monopolistique portant sur l'entrée dans les divers niveaux d'instruction ;

(c) l'accroissement ou la diminution de la demande sur le marché.

Quand l'enseignement, ou la formation complémentaire considéré, déplace l'étudiant d'un groupe salarial bien défini du monde du travail à un autre groupe salarial bien défini, les bénéfices économiques peuvent être évalués de façon presque sûre. L'analyse coût-bénéfice pourrait, par conséquent, être utile pour l'évaluation des programmes de recyclage. Ces programmes ont quelquefois pour but principal de réduire le taux du chômage. Quelques exemples de ces analyses se trouvent dans les ouvrages /̄28, 30̲/. T.I. Ribich /̄31, Chapitre 3̲/ a effectué la comparaison et l'évaluation des résultats de ces études. Récemment, dans ce domaine, on a noté une nette recrudescence des études portant sur le coût-bénéfice.

Somme toute, il semble bien qu'il existe, dans la planification de l'enseignement, un certain nombre de problèmes particuliers qui pourraient être éclaircis par l'emploi d'analyses coût-bénéfice. Dans la plupart des cas, des indications des échantillons suffisent ; parfois, cependant des données concernant l'ensemble de la population peuvent constituer un avantage. Il y a peu de chances que les analyses coût-bénéfice fournissent des réponses définitives aux questions d'ordre général telles que "Y-a-t-il sous ou sur-investissement dans le domaine de l'enseignement ?" Elles pourraient cependant donner des indications précieuses sur l'incidence économique des diverses options politiques, dans certains secteurs de l'enseignement.

ANNEXE I

MESURES A MULTIPLES DIMENSIONS DE L'EFFICACITE

Dans tous les cas où un système (ou une activité) comporte plusieurs objectifs qui s'opposent partiellement, on ne peut définir aucune mesure à une dimension de l'efficacité. Si, cependant, on a déterminé le degré de réalisation des divers objectifs, on peut comparer directement les options relatives à cette réalisation en comparant leurs coûts, à condition qu'il existe une mesure à une dimension du coût. De même, dans le cas où l'on a défini une limite supérieure du coût ainsi que des limites inférieures pour toutes les mesures de l'efficacité sauf une, le problème qui reste à résoudre se réduit à une comparaison à une dimension. Au lieu de cela, si une limite du coût est donnée et que le choix doit s'opérer entre diverses options obéissant à cette restriction, nous obtenons un vecteur de l'efficacité :

$$\mathbf{E} = (e_1, e_2, \ldots, e_n)$$

dans l'hypothèse où il y a plusieurs objectifs (partiellement opposés) (1). Il existe plusieurs traitements de ce problème, selon le cas envisagé. Sans chercher à traiter ce sujet de façon complète, nous allons donner ci-dessous quelques suggestions concernant le cas le plus simple avec une mesure de l'efficacité à deux dimensions ($n = 2$). Notre but est de démontrer que, même s'il est habituellement impossible de trouver des solutions optimales, les analyses coût-efficacité donnent souvent naissance, dans un cas à multiples dimensions, à des solutions plus satisfaisantes que celles qui auraient pu être obtenues autrement.

Nous faisons la distinction entre un certain nombre de cas :

I. Solution à une dominante

Les mesures de l'efficacité sont représentées par l'équation suivante :

$$\mathbf{E}^i = (e_1^i, e_2^i)$$

dans laquelle i représente l'i ème option. S'il existe une solution j pour laquelle

$$e_1^j \geq e_1^i \quad \text{et} \quad e_2^j \geq e_2^i$$

pour toutes les valeurs de i, cette solution est alors "dominante" et constitue évidemment la meilleure solution.

---

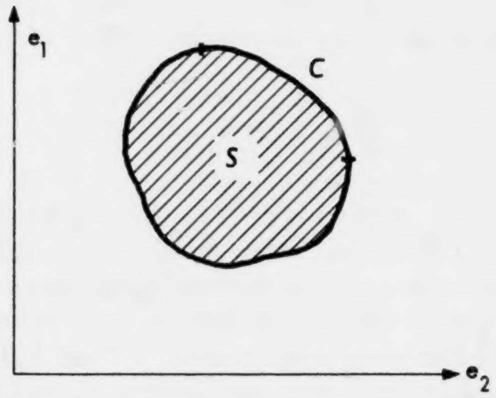
(1) On peut transposer sous une forme logiquement équivalente le cas d'un coût variable, par l'addition d'une dimension de l'efficacité, en choisissant par exemple $e_{n+1} = \frac{1}{c}$ comme mesure additionnelle de l'efficacité (c = coût).

II. Solutions à plusieurs dominantes

Parfois, certaines des options étudiées peuvent être éliminées par la méthode précédente, c'est-à-dire que l'option i pour laquelle

$$e_1^i < e_1^j \quad \text{et} \quad e_2^i < e_2^j$$

pour une certaine option j , n'est visiblement pas une option aussi bonne que l'option j ; i peut donc être éliminé du choix final. Ce procédé peut être illustré par le diagramme ci-après :



Les différentes options correspondent à la surface ombrée S qui, pour les besoins de l'illustration a été ici présumée continue. Tous les points situés à l'intérieur de S ainsi qu'une partie du contour, ne sont pas aussi satisfaisants que ceux situés sur C qui se trouvent sur la droite (valeurs e_2 plus grandes) et au-dessus (valeurs e_1 plus grandes) des autres points. Les points situés sur C sont quelquefois appelés solutions "efficaces".

A ce stade, tout effort entrepris pour la recherche d'options nouvelles et plus satisfaisantes se révèle souvent très profitable. Si l'on peut arriver à des options comportant des mesures de l'efficacité correspondant à des points situés sur la droite et au-dessus de C , le problème du choix se trouve évidemment amélioré.

Supposons qu'il y ait plusieurs (ou un nombre infini) de points "efficaces", c'est-à-dire qu'il reste plusieurs options après élimination, par la méthode indiquée précédemment, de celles qui ne présentent manifestement guère d'intérêt. Il est alors impossible de déterminer la solution finale, sans une connaissance additionnelle portant sur les préférences du décideur. Les hypothèses relatives aux critères de choix ou préférences seront étudiées au paragraphe suivant.

Fonction de préférence

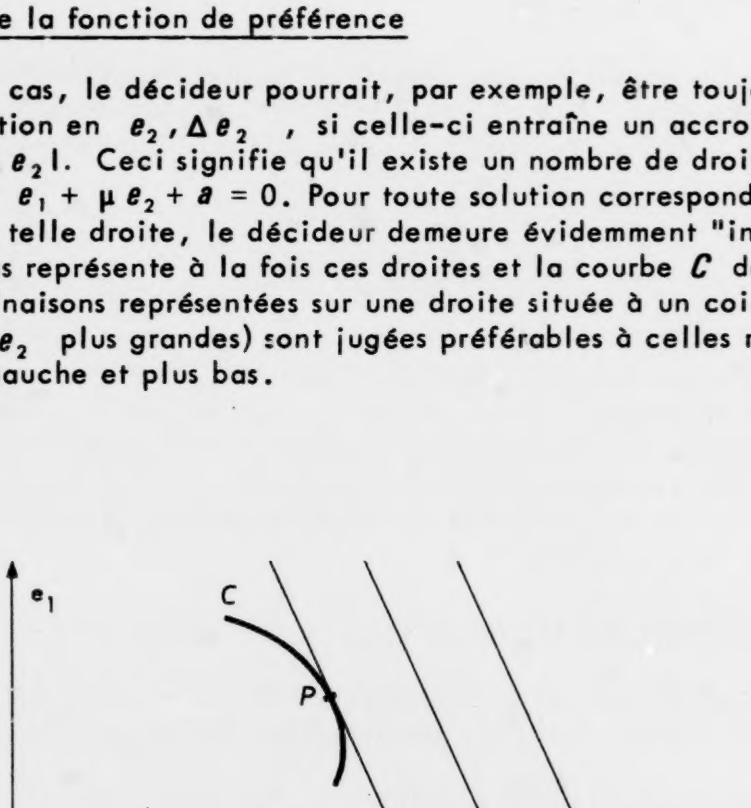
Supposons qu'il existe une fonction de préférence $P(e_1 , e_2)$ définie de telle sorte que la maximisation de $P(e_1 , e_2)$, pour les diverses solutions, corresponde à la solution optimale. La difficulté est d'arriver à une définition de cette fonction de préférence. Nous distinguons entre les deux cas suivants :

(a) le décideur perçoit instinctivement l'importance de e_1 par rapport à e_2 ,

(b) on peut évaluer la fonction $P(e_1 , e_2)$ en étudiant le problème à un niveau "supérieur" de décision.

Evaluation directe de la fonction de préférence

Dans le premier cas, le décideur pourrait, par exemple, être toujours disposé à accepter une diminution en $e_2 , \Delta e_2$, si celle-ci entraîne un accroissement de plus grand que $| \mu \Delta e_2 |$. Ceci signifie qu'il existe un nombre de droite d'"indifférence" avec des équations $e_1 + \mu e_2 + a = 0$. Pour toute solution correspondant à divers points situés sur une telle droite, le décideur demeure évidemment "indifférent". Le diagramme ci-dessous représente à la fois ces droites et la courbe C des solutions efficaces. Les combinaisons représentées sur une droite située à un coin supérieur droit (valeurs e_1 et e_2 plus grandes) sont jugées préférables à celles représentées sur une droite située à gauche et plus bas.



Le point de tangence, P , entre la courbe C et une droite d'indifférence, correspond évidemment à la solution. A partir de ce point, il n'est plus possible d'améliorer la position, c'est-à-dire de se déplacer vers une droite d'indifférence plus élevée, en choisissant une autre solution, donc en se déplaçant le long de C .

La fonction de préférence correspond à l'équation des lignes d'indifférence, c'est-à-dire :

$$P(e_1 , e_2) = e_1 + \mu e_2$$

Pour les points situés sur la courbe C , elle a son optimum pour

$$\frac{de_1}{de_2} + \mu = 0$$

c'est-à-dire le point de tangence.

D'une façon plus générale, les "lignes" d'indifférence pourraient être n'importe quelle famille de courbes $e_1 + \mu (e_2) + a = 0$ correspondant à une fonction de préférence $P(e_1 , e_2) = e_1 + \mu(e_2)$ avec une solution optimale pour

$$\frac{de_1}{de_2} = \frac{d\mu}{de_2}$$

quand certaines conditions de régularité sont remplies. On a beaucoup écrit sur la recherche théorique de la solution optimale quand la fonction de préférence est connue et quand il existe différentes catégories de contraintes. En pratique cependant, une connaissance complète de la fonction de préférence est souvent impossible mais une connaissance partielle peut déjà diminuer le nombre des options. On peut alors opérer un choix définitif entre les options toutes supérieures à celles qui ont été éliminées par l'analyse.

Calcul de la fonction de préférence à partir de considérations du niveau "supérieur"

Parfois la cause de mesures multiples de l'efficacité réside dans le niveau auquel les problèmes sont étudiés. Prenons, par exemple, les cas suivants :

- Décision du niveau supérieur : allocation de ressources aux instituts de technologie pour la "production" d'ingénieurs.
- Décision au niveau inférieur : allocation de ressources à l'intérieur de l'établissement. Diverses options influeront sur le nombre relatif des étudiants dans les diverses sections (spécialités diverses).

En ce qui concerne le problème au niveau inférieur, il existe une mesure "multidimensionnelle" de l'efficacité correspondant au nombre différent d'ingénieurs "produit" sur les différentes lignes. Pour en revenir à la décision au niveau supérieur, elle pourrait être fondée sur des recherches concernant les pénuries d'ingénieurs dans certains ou peut-être même dans tous les domaines. Dans ce dernier cas, la fonction de préférence est simplement la somme des différentes mesures de l'efficacité.

$$P(e_1 , e_2 , \ldots) = e_1 + e_2 + .. e_n .$$

Critères guidant le choix

On peut définir un critère de choix au moyen d'une fonction de préférence comme nous l'avons mentionné ci-dessus. Il y a, cependant, d'autres méthodes. Supposons qu'il existe différentes options j avec des mesures de l'efficacité

$$\mathbf{E}^{j} = (e_{1}^{j} , e_{2}^{j} , \ldots).$$

Prenons par exemple :

$$\mathbf{E}^{1} = (10,100)$$

$$\mathbf{E}^{2} = (90,50)$$

Aucune de ces deux options ne semble intéressante à moins qu'il ne soit reconnu que e_1 , ou e_2 , ait une importance primordiale. Supposons que l'on puisse trouver de nouvelles options, par exemple en combinant les anciennes,

$$\mathbf{E}^{3} = (70,50)$$

$$\mathbf{E}^{4} = (60,80)$$

Dans les lignes qui suivent, nous allons définir un critère de choix qui corresponde à une large série de fonctions préférentielles "usuelles". En premier lieu, les valeurs e_1 et e_2 sont calculées en pourcentage de leurs valeurs respectives maximales. Nous obtenons les pourcentages suivants :

	Nombre	e_1	e_2
	1	⑪	100
	2	100	⑳
	3	78	㊿
→	4	(67)	80

Pour chacune des options, on regarde les valeurs minimales de e_1 et e_2 (entourées d'un cercle sur le tableau ci-dessus) et l'option ayant la valeur minimale la plus élevée est définie comme la meilleure (n° 4 dans cet exemple). Généralement, dans un cas "multi-dimensionnel", chaque mesure de l'efficacité étant exprimée en pourcentage de la mesure la plus élevée dans la même dimension, l'option j pour laquelle

$$\min_{i} \; e_{i}^{j}$$

atteint son maximum est l'option préférée.

Ce critère pourrait être utile quand on sait très peu de choses sur l'importance relative des différentes mesures de e_i . On peut l'employer également dans un cas "uni-dimensionnel" lorsque la mesure de l'efficacité revêt des valeurs différentes pour différents "environnements " futurs possibles qui ne sont pas l'objet d'un contrôle de la part du décideur. Dans ce cas, le critère de choix défini ci-dessus est habituellement nommé "planification de l'éventualité". Cette question sera traitée un peut plus loin dans l'Annexe 3. On peut également appliquer la même méthode lorsqu'il y a un écart, dans la partie non mesurable de l'efficacité, entre les divers "environnements" (c'est-à-dire entre les différentes colonnes).

ANNEXE II

ANALYSE COÛT-EFFICACITE A DIFFERENTS NIVEAUX

Ainsi que nous l'avons mentionné dans le texte principal (p.62, dernier paragraphe) habituellement, une forte interdépendance entre les analyses coût-efficacité aux différents niveaux de la décision. Pour vérifier si l'on a trouvé la répartition optimale des ressources on peut utiliser la comparaison de l'efficacité marginale de différents programmes. L'égalité des efficacités marginales est une condition nécessaire pour obtenir l'optimum (si l'optimum est situé dans l'intervalle de variation et non sur un point extrême). Elle n'est pourtant pas une condition suffisante puisque :

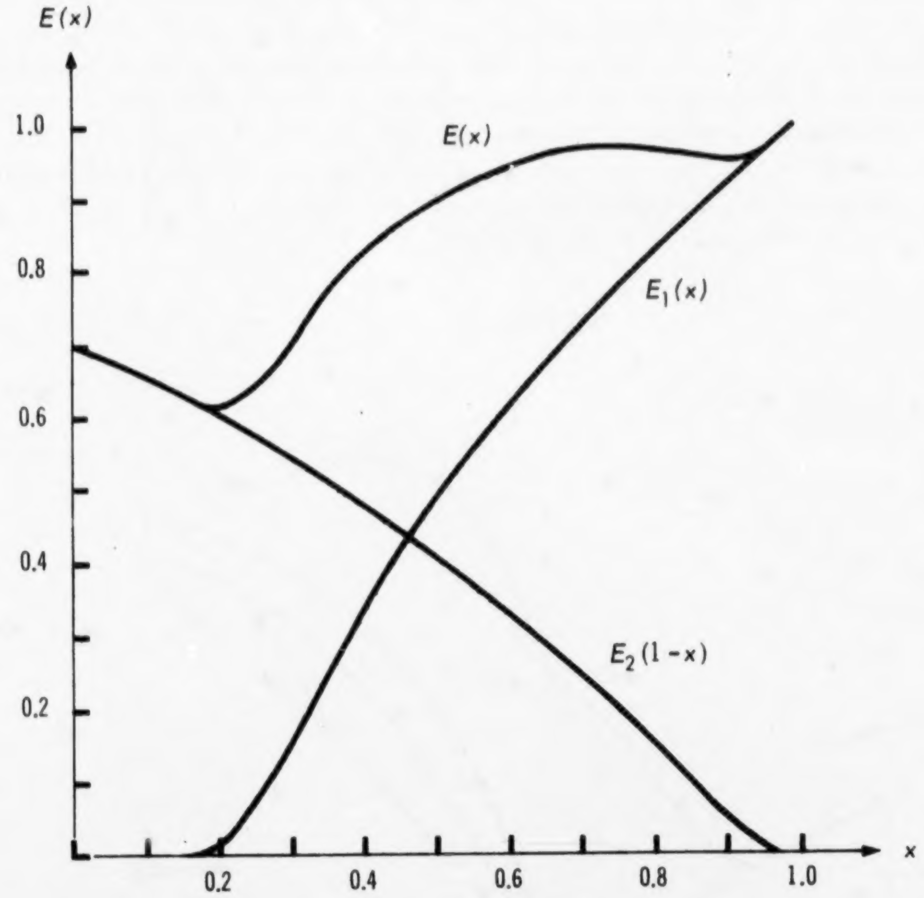
(a) une efficacité marginale égale peut également être obtenue pour des minima et des maxima locaux et, par conséquent, n'implique pas que l'on ait trouvé l'optimum total ;

(b) aucune conclusion définitive ne peut être fondée sur l'efficacité marginale si la répartition des ressources dans le cadre de chaque programme n'est pas optimale.

Ces deux points seront illustrés ci-dessous par la schématisation de l'étude d'un cas réel portant sur un problème de planification de la défense.

Supposons que l'on ait l'intention de prendre une décision au sujet de la répartition des ressources entre deux programmes (systèmes d'armement) dans le cadre d'un budget fixe c. Représentants par $E_1(x)$ et $E_2(c-x)$ la mesure de l'efficacité respective des premier et second programmes, x et $c-x$ traduisant les dépenses engagées pour l'exécution de chacun de ces programmes. Nous donnons un exemple chiffré sur le diagramme I. Dans le but de faciliter les notations, nous avons choisi, comme unité de coût, le budget total c, et comme unité de l'efficacité, l'efficacité $E_1(c)$.

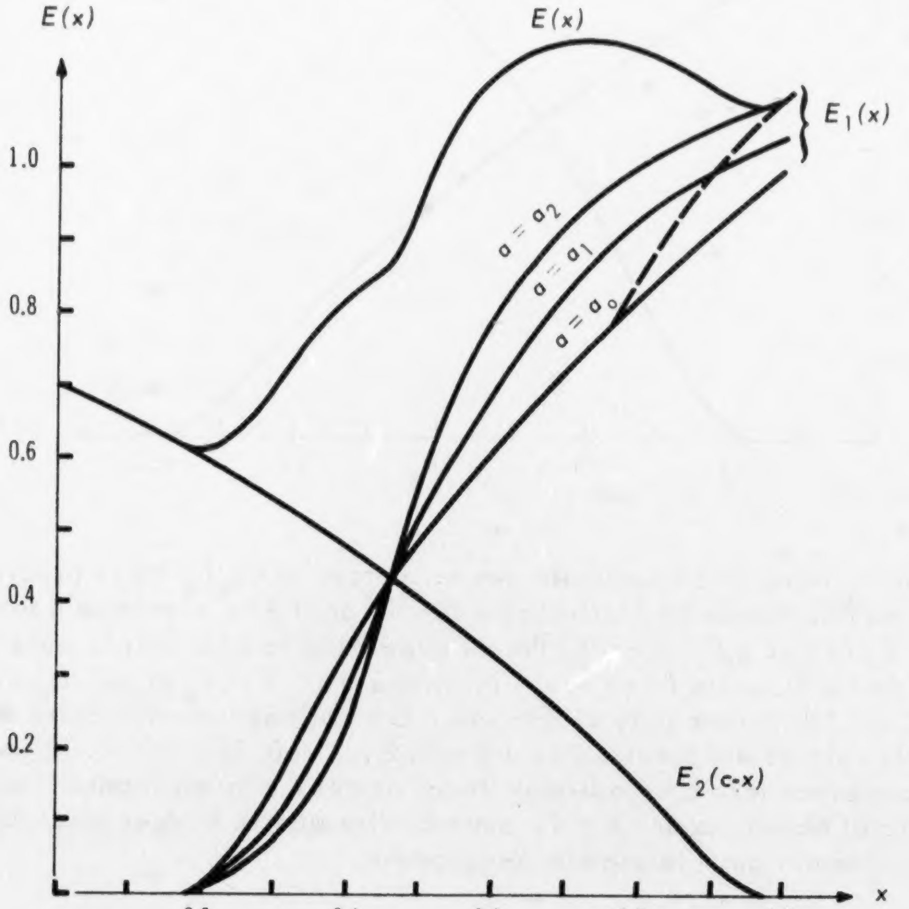
Graphique I



On obtient la répartition optimale des ressources entre les deux programmes, en maximisant la mesure totale de l'efficacité si elle peut être exprimée quantitativement en termes de $E_1(x)$ et $E_2(c-x)$. Pour l'hypothèse la plus simple dans laquelle la mesure totale de l'efficacité $E(x)$ égale la somme de $E_1(x)$ et de $E_2(c-x)$, la fonction $E(x)$ est illustrée par le diagramme. On obtient une efficacité marginale égale pour trois valeurs différentes de x ($x = 0,2$; $x = 0,75$; $x = 0,92$) mais ces valeurs de x correspondent à un optimum local et deux minima locaux, tous au-dessous de l'optimum total obtenu pour $x = 1$, c'est-à-dire que le budget total doit être dépensé exclusivement pour le premier programme.

Pour illustrer l'importance d'une répartition correcte à l'intérieur des programmes dans la répartition entre les programmes nous supposons maintenant qu'une répartition a été basée sur des évaluations préalables du coût et de l'efficacité obtenues pour $x = 0,75$ (75 % du budget allant au premier programme et 25 % au second). Lorsqu'on dispose d'évaluations plus précises on reconsidère le problème de la répartition. Le premier programme comprend deux composantes principales, le paramètre a reflétant la répartition entre ces deux composantes. Le choix de a peut ainsi être nommé répartition au niveau inférieur. Le responsable du premier programme peut désormais raisonner comme suit : les évaluations nouvelles du coût montrent qu'il manque des fonds pour l'une des deux composantes. Si l'on pouvait obtenir davantage de fonds provenant du second programme, puis les porter sur cette composante, on aboutirait à un accroissement considérable de l'efficacité et une efficacité marginale beaucoup plus élevée que celle qui possède le second programme pour $0,75 \leq x \leq 1$. Par conséquent, les fonds préalablement répartis sur le second programme devraient être transférés sur le premier. Le caractère fallacieux de ce raisonnement est illustré par le diagramme ci-dessous. L'efficacité du premier programme est représentée par $E_1(x, a)$, a pouvant varier entre a_0 et a_2. La valeur a_0 correspond à la première répartition entre les deux composantes du programme. Les fonctions $E_1(x, a_0)$, $E_1(x, a_1)$ et $E_1(x, a_2)$ sont tracées sur le diagramme.

Graphique II



La courbe pointillée pour une valeur x située entre 0,75 et 1, correspond à la "ligne d'argumentation" déjà mentionnée, selon laquelle un accroissement de x allant de 0,75 à 0,9 rendrait possible une variation de a_0 à a_1 et un autre accroissement jusqu'à $x = 1$, une variation de a_1 à a_2. La pente de cette fonction est tout-à-fait élevée et dépasse celle de $E_2(c - x)$. Cependant, même sans modifier la répartition entre les programmes, la répartition intérieure pourrait être améliorée par une variation de a_0 à a_2. Pour trouver l'optimum total, on doit prendre en considération, pour une valeur $x > 0,5$, la fonction $E_1(x, a_2)$ et non $E_1(x, a_0)$. Pour l'efficacité totale $E(x)$, nous obtenons :

$$E(x) = E_1(x, a_2) + E_2(1 - x) \text{ pour } 0,5 \leq x \leq 1$$

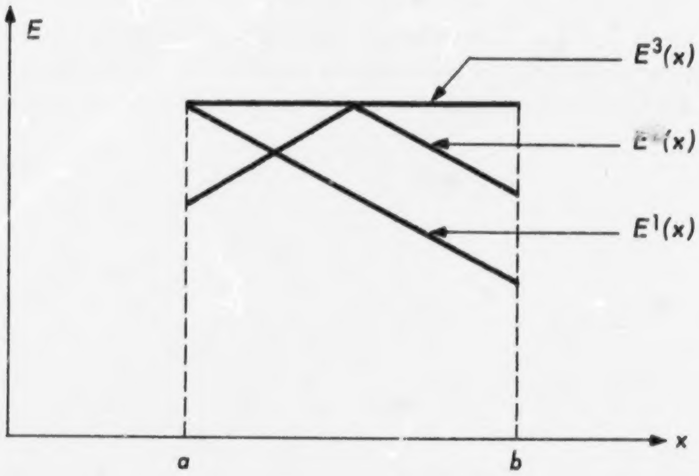
$$E(x) = E_1(x, a_0) + E_2(1 - x) \text{ pour } 0 \leq x \leq 0,5$$

Il ressort du diagramme que l'optimum total est obtenu pour une valeur $x \sim 0,72$. Par conséquent, il n'existe aucune raison d'attribuer des fonds supplémentaires du premier programme, c'est-à-dire, de faire croître x au-dessus de 0,75. Théoriquement x devrait être diminué à 0,72. En pratique ceci peut ne pas valoir la peine, l'optimum étant très étalé et les modifications opérées à partir des décisions préliminaires entraînent quelquefois différentes sortes de coûts non directement mesurables.

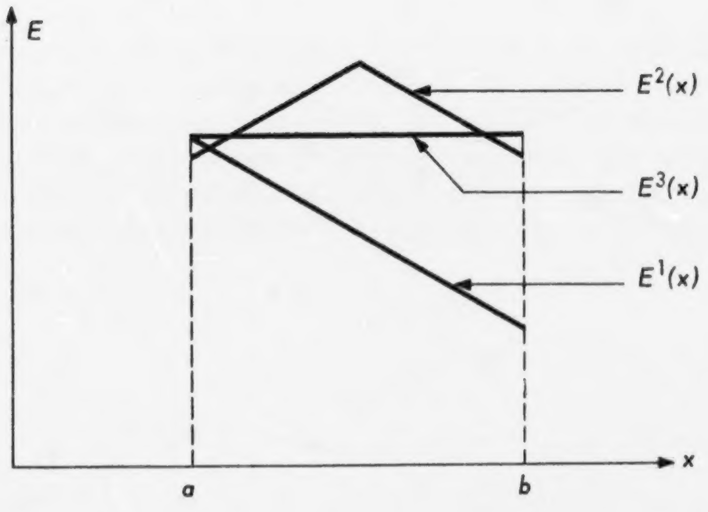
ANNEXE 3

PLANIFICATION DE L'EVENTUALITE

Supposons qu'une mesure de l'efficacité ait été définie et évaluée et qu'il existe une source essentielle d'incertitude, par exemple, le nombre X d'étudiants (dans l'ensemble du système d'enseignement ou dans une région ou une école sous analyse). Prenons une formule de l'efficacité $E^n(X)$ conformément au diagramme ci-dessous, n représentant les différents projets de solutions possibles dans le cadre d'un système budgétaire donné (par exemple, diverses tailles d'écoles) et X ayant un intervalle d'incertitude de a à b.



Dans cette hypothèse, nous avons $E^3(X) \geq E^2(X)$ et $E^3(X) \geq E^1(X)$ pour toutes les valeurs de X qui nous intéressent. Ainsi, il est évident que la 3ème solution, $E^3(X)$, est la meilleure et que ce résultat n'est pas influencé par l'incertitude en X. Supposons, cependant, que la fonction de l'efficacité se présente quelque peu différemment.



Dans ce cas, la solution dépend de l'information possédée sur la densité de probabilité de X. Si tout porte à croire que X se situera tout près de a ou b, on pourrait, alors, préférer la solution $E^3(X)$. Cette préférence repose évidemment sur la probabilité que X s'éloigne de a et b de telle sorte que $E^3(X) \leq E^2(X)$ et sur la volonté de prendre le risque correspondant. Si, cependant, on ne sait rien sur la densité de probabilité de X — lorsque l'incertitude de X est irréductible — on choisit alors la seconde solution $E^2(X)$ puisqu'elle ne donne pour aucune des valeurs de X une mesure de l'efficacité considérablement inférieure à la valeur maximale de l'efficacité. Cette règle de choix est habituellement appelée planification de l'éventualité. Dans l'exemple présenté on peut donner une définition plus précise comme suit :

> Choisir la solution N pour laquelle $E^N(X)$ dépasse, pour chaque valeur de X, un certain pourcentage p (p étant le plus élevé possible) des autres valeurs de l'efficacité correspondant à la même valeur de X, c'est-à-dire choisir la valeur N pour laquelle :
>
> $$E^N(x) \geq p \cdot E^n(x)$$
>
> pour toutes les valeurs X et n et pour la valeur de p la plus grande.

Dans le cas de plusieurs facteurs incertains, des règles de décision analogues peuvent être formulées. Parfois, le facteur incertain X ne prend que des valeurs discrètes. Même dans cette hypothèse, on peut formuler de la même façon la règle du choix.

Il existe plusieurs variantes de la règle de décision donnée ci-dessus, par exemple au lieu de comparaisons qui se basent sur un certain pourcentage de la valeur maximale, on pourrait prendre en considération une certaine diminution fixe de la valeur maximale. Le choix le plus raisonnable d'une règle de décision dépend naturellement du problème dont il s'agit.

Les règles de décision du type de celles données ci-dessus sont appelées planification de l'éventualité lorsque le paramètre incertain X correspond aux environnements futurs du système étudiés qui ne se trouvent pas soumis au contrôle du décideur. Le même type de règles de décision peut, cependant, être utilisé dans d'autres cas, lorsqu'il y a incertitude quant à la question de savoir quelle mesure de l'efficacité appliquer ou quand il existe une mesure "multi-dimensionnelle" de l'efficacité (cf. Annexe 1).

BIBLIOGRAPHIE

Ouvrage portant d'une façon générale sur la programmation budgétaire et l'analyse coût-efficacité

1. David Novick (éditeur) "Program Budgeting : Program Analysis and the Federal Budget", Presse de l'Université de Harvard, Cambridge, Massachussets, 1965. (Compte rendu dans J. Orsa, 1966, pp. 173-177).

2. Gene H. Fischer "The World of Program Budgeting", the Rand Corporation, P - 3361, mai 1966.

3. Robert N. Grosse : "An Introduction to Cost-effectiveness Analysis", document RAC, RAC - P - 5 publié en juillet 1965.

4. E.S. Quade (éditeur) : "An Appreciation of Analysis for Military Decision", Rand Mc Nally/North Holland, 1964.

5. E.S. Quade : "Systems Analysis Techniques for Planning Programming - Budgeting", mars 1966. Rand Corporation, P - 3322.

6. E.S. Quade : "Cost-effectiveness : An Introduction and Overview", Rand Corporation, mai 1965, pp. 31 - 34.

7. Robert Dorfman (éditeur) "Measuring Benefits of Government Investments", The Brookings Institution, Presse de l'Université de Princeton, 1965.

8. A. Maass : "Benefit-Cost Analysis. Its Relevance to Public Investment Decisions". Quart. Jour. Econ., mai 1966, 80 (2) Université de Harvard, Etats-Unis (compte rendu dans le volume IV, n° 4, p. 618).

Ouvrages portant d'une façon générale sur l'analyse coût-bénéfice

9. Gary S. Becker : "Human Capital", Presse de l'Université de Columbia, New York et Londres, 1964.

10. A.R. Prest et R. Turvey : "Cost Benefit Analysis, A. Survey", Economic Journal, décembre 1965.

Planification de l'enseignement. Programmation budgétaire

11. Harry Williams : "Planning for Effective Resource Allocation in Universities", American Council of Education, Washington, D.C., 1966.

12. T.A. Struve et G.J. Rath : "Planning - Programming - Budgeting in Education, A Systems Approach to Capital Budgeting in School Districts", Education Technology, 15 juin 1966.

13. Elaine Exton : "The Word from Washington", American School Board Journal (novembre 1966), pp. 39 - 43.

14. Paul W. Hamelman : "Academic Planning With Program Budgeting", présenté à la section IV sur le coût-efficacité - 32ème assemblée nationale de la Société américaine de Recherche Opérationnelle, 3 novembre 1967.

15. Miller, James L. jr. : "State Budgeting for Higher Education", publication de l'Institut d'Administration Publique, Ann Arbor, Université de Michigan, 1964.

16. Richard W. Judy : "Simulation and Rational Resource Allocation in Universities", O.C.D.E. DAS/EID/67.7.

17. Compte rendu de la Conférence Nationale des Législateurs des Etats, Washington D.C., 4 - 6 décembre 1966.

Analyse coût-bénéfice

18. Planleggnings sekretariatet, Kirke - og Undervisnings departementet, Norvège

Notat 15/6-64 KE/ki, "Forelopig utkast til modell for driftskostnader i barneskolen"

Notat 8/3-66 KEi/ki, "Kostnadsutviklingen i folkeskolen Driftskostnadene"

Notat 2/5-67 KEi/fle, "Utviklingen av driftskostnader og laererbehov i gymnasiet og verksteds skolen fram til 1985".

19. C.F. Carter : "The Economics of Higher Education", The Manchester School of Economic and Social Studies, janvier 1965.

Analyse coût-bénéfice dans l'enseignement

20. G. Becker : "Human Capital. A Theoretical and Empirical Analysis with special reference to Education", Presse de l'Université de Columbia, New York et Londres, 1964.

21. T. Schulz : "The Economic Value of Education", Presse de l'Université de Columbia, New York et Londres, 1964.

22. M. Blaug : "The Rate of Return on Investment in Education in Great Britain", The Manchester School of Economic and Social Studies, septembre 1965.

23. Burton, A. Weisbrod : "External Benefits of Public Education, An Economic Analysis", Université de Princeton, 1964.

24. Burton, A. Weisbrod : "Investing in Human Capital", The Journal of Human Resources, volume 1, n° 1, été 1966.

25. Hirsch, Werner and Morton Marcus : "Some Benefit-Cost Considerations of Universal Junior College Education", National Taxation Journal, n° XIX, mars 1966, pp. 19 - 48.

26. W.L. Hansen : "Total and Private Rates of Return to Investment in Schooling", Journal of Political Economy, volume LXXI, avril 1963.

27. S.J. Hunt : "Income Determinants for College Graduates and the Return to Educational Investment", Yale Economic Essays, automne 1963.

28. M.E. Borus : "A Benefit-Cost Analysis of the Economic Effectiveness of Retraining the Unemployed", Yale Economic Essays, volume 4, n° 2, automne 1964.

29. D.A. Page : "Retraining Under the Manpower Development Act : A Cost-Benefit Analysis", Public Policy, volume 13, 1964.

30. G.G. Somers, E.W. Stromsdoerfer : "A Benefit-Cost Analysis of Manpower Retraining", Industrial Relations Research Association Proceedings, décembre 1964.

31. T.I. Ribich : "Education and Poverty", Economic Studies Division, The Brookings Institution, Washington, D.C., septembre 1966.

32. M. Blaug : "Approaches to Educational Planning", The Economic Journal, juin 1967.

PART II

THE BUDGET AS AN INSTRUMENT FOR MEDIUM AND LONG-RANGE PLANNING AND PROGRAMMING OF EDUCATION

by Werner Z. Hirsch

In planning education we seek: to scan the horizon for a view of what the future, or alternative futures, might bring; to identify changing goals and responsibilities; to draw attention to likely areas of concern or potential imbalance; and to anticipate potential solutions for the problems that might develop. Concern might arise because resources are underutilized, are insufficient to achieve objectives, or are allocated in ways inconsistent with objectives. Imbalances result from scarcities, affluence, and new technology. Consequences of the imbalances will not affect all segments of the system equally. Groups likely to be affected in different ways can be defined by age, location, special types of economic activities, special socioeconomic handicaps, special physical-psychological-intellectual needs, etc. Once goals and opportunities, and problems and possible solutions, of the education enterprise have been identified the second purpose of planning is to help investigate the relative merits of alternative solutions. Alternative courses of action are identified and policies are evaluated in an effort to select preferred solutions that are consistent with the goals and opportunities.

Thus, planning is intended to assist in the development of information and guidelines to such education questions as to what activities should be undertaken, what programs should be developed, how should funds be allocated between programs, are programs consistent with each other, what goals and objectives should officials seek to achieve through their programs, who should mainly benefit from and who should pay for education, how many students should be educated by how many teachers and support personnel with what background and training and in what facilities and where?

For planning to be capable of implementation the planning process must not end with the preparation of a set of recommendations or plans prepared in isolation from the programs through which they must be implemented. The mechanism for implementation includes the preparation of programs in physical and financial terms which ultimately are set forth in the budget. A useful budget should represent estimates of the cost of carrying out recommended programs over a number of years. It should constitute a plan, which is annually reviewed and possibly revised for implementing policy. In this sense the budget represents a commitment on the part of the governing body of the education enterprise to allocate scarce resources to specific activities so as to attain specified objectives. Preferably some output estimates should accompany the budget.

It is helpful to have a budget which is structured so that it facilitates the measurement of costs to key specified objectives as well as comparison of alternative courses of action. The entire education enterprise as well as its subunits should be encouraged to formulate program goals which are regarded as basic to their commitment to action and represent ultimate measures against which actions must be validated. The budget should help identify specific objectives through which broad goals are translated into practical terms and should assist in the evaluation of activities in terms of their effectiveness in contributing to program objectives.

Program budgeting is a planning and management process with structural, analytical and administrative-organizational dimensions. It can shed light on the likely contributions of different programs toward the achievement of objectives, and on their likely costs. Furthermore, program budgeting permits incorporation of these structures into the budget as a first step in implementation.

It is essential that the planning and budgeting processes be very closely linked. If planning is to be fruitful it must effectively contribute to the process by which the different units in the system identify their missions, specify their goals and objectives, develop alternative programs to achieve these objectives and state their resources and monetary implications, evaluate alternatives and select the most effective programs. Since many programs cut across departmental lines it is important to prepare a plan that identifies who is expected to make what contributions to the accomplishment of the mission. When a plan is prepared for a broad area, i.e., the entire education enterprise, it cuts across numerous administrative units and thus becomes in essence a mechanism for coordination.

Some Budget Concepts

The conventional budget has evolved over many years and is shaped mainly by the desire to safeguard appropriations against carelessness and malfeasance. Thus the traditional administrative budget does not allow one to relate required resources and costs directly to the specific outputs or goals to be achieved. It is therefore not a basic instrument for planning and managing the education enterprise. Its main concern is with line items, e.g., personnel, equipment, electricity, etc. and thus it is more a comptroller's budget than a manager's budget.

The program budget is output oriented. It allows the activities of several departments and offices to be assembled as specific output packages, i.e., programs and subprograms, of various convenient levels of aggregation. For example, we can identify some policy instruments to achieve our goal of enhancing human resources. Therefore, allocation decisions must be made, for example between a vocational retraining program to develop new skills in the work force and a college education program to enhance the level of scholarly, scientific, and artistic contributions. These two programs compete with each other for resources. Each in turn is made up of alternative subprograms which compete with each other for resources as inputs for achieving the specific program objectives. Thus, a mechanic's or nurse's training can be viewed as alternative forms of vocational training that are more competitive with each other than they are with college studies in physics, mathematics, and history, which may compete with each other under the education program for scholarships.

Ultimately, the program budget extends down to the input level of basic building blocks of the various required resources; manpower (teachers, principals, librarians, etc.) buildings, equipment, materials, etc. may be combined and recombined in various ways to specify packages in the output hierarchy. Breaking down and combining budget units allows the decision maker to reconstruct the program budget at his particular level of responsibility in line with specified goals. Its flexibility allows for convenient reformulation to accomodate change in interests and objectives.

The program budget format requires that outputs be quantifiable to some extent so that projected expenditure data that appear in the budget can be meaningfully related to projected performance. More will be said below about the kind of monetary and physical data we would like to see incorporated in a program budget.

Finally, a program budget should have an extended time horizon. The traditional organization of budgetary data rarely offers a profile of the future expenditures linked to or implied by a current investment decision. But to make rational choices the decision maker must know something about the future expenditure implications of decisions he makes today. What will be the future annual costs of operating a building proposed for construction now? Thus the time horizon of the program budget necessarily extends several years into the future. More will be said below about program budget projection methods.

There is yet another type of budget that deserves a few comments -- the performance budget. This budget focuses on unit costs, e.g., man-hours, of specified activities. Although activities may be arranged in different ways within the budget structure they are most often arranged by department. A key purpose of the performance budget is to facilitate judgment about "What is the least-cost method of undertaking a given activity?" This is quite different from the concern of the program budget, which is to facilitate decisions about "What activities should be undertaken?" In one sense the performance budget is an ex post budget whereas the program budget is an ex ante budget. Thus, the performance budget seeks the least-cost method of undertaking a given activity; it ignores benefits and the question of what activities should be undertaken. Clearly, a decision to provide services in the least costly manner, that neglects benefits, can produce economically inefficient solutions.

Structuring the Program Budget

In our efforts to structure the program budget for education we must be guided by considerations of what are the goals of education, who is the education decision maker, and what are the kinds of information he needs.

We know all too well that it is not easy to relate education programs at various levels directly to both personal and national goals and aspirations. In a broad sense we can consider education to have as its objective the preparation of individuals for rewarding employment, adequate income, effective use of leisure, effective family membership, fulfillment of civic and social responsibilities in our society, etc. Although we might agree on these broad goals of education, it is difficult to isolate the education activities that contribute exclusively to any one of them. Rather, schools and universities contribute to two or three of these goals at the same time. In a global frame of reference we can argue that urbanized, affluent societies can spend more to meet their leisure objective while developing nations must emphasize the objectives of increasing employment and income. However, serious conceptual and empirical problems prevent us from working with education subprograms of this sort.

On a pragmatic level we can benefit from the fact that education approximates a vertical structure having lower levels that generally lead to higher ones and in which adult training and re-training subprograms offer some shortcuts and flexibility. Thus the education system provides pupils with primary education and the number of youngsters who have acquired a specified stock of primary education, that is, a given addition to knowledge, can be taken as system output. In the same way, the numbers of students who have received specified secondary and higher educations reflect system output; in a sense the same holds for adult education. In addition to primary, secondary, higher, and adult education subprograms, we might want to consider library services and research. Although they are different from the first four instructional subprograms they are designated subprograms because it would be very difficult to prorate library services and research and include them under the other subprograms. They are supporting services of an overhead nature.

Countries differ greatly in how they operate and finance their education enterprises. In a highly centralized government the Education Ministry can take far-reaching steps in seeking answers to the famous questions, what, when, where, how, by whom, and for whom? Developing a program budget for a highly centralized government poses many other difficulties but the problems of intergovernmental fiscal relations can be ignored.

Because of the large number of issues the program budget should elucidate, we would ideally want to build a multidimensional matrix. Let us illustrate the need in relation to primary and secondary education. We could, for example, break primary and secondary education down into the following subprograms: improving basic capabilities, improving occupational capabilities, improving physical capabilities, and enhancing the quality of life. General support could be another subprogram. Under the first subprogram, improving basic capabilities, we could include mathematics, natural and physical sciences, languages, social studies, etc. Under the subprogram, improving occupational capability, we could include agriculture, business education, driver education and training, homemaking, industrial vocational education, music instruction, etc. The sub-subprogram for improving physical capabilities includes mainly physical education and health education; the sub-subprogram, enhancing the quality of life, includes literature, art, music, etc. Clearly, overlapping will occur; for example, knowledge of the native language is an important ingredient of more than one sub-subprogram.

Beneficiaries or target groups represent another dimension of the matrix. There has always been much interest in the question of how much should be allocated to the gifted child as compared to the slow learner. Then there are the physically handicapped as well as the mentally handicapped children. Socioeconomic groups are important, and in some countries race plays a major role. Finally, from the viewpoint of the national government difficult decisions must be made about geographic areas that should be either favored or penalized in terms of primary and secondary education.

What has been pointed out above, in the illustration of a multidimensional matrix for primary and secondary education, must be examined for its application to higher education, adult education, library services, and research. A further consideration is that, particularly from a national point of view, teaching and research work compete for talent and for a given person's time.

The Ministry of Education in a highly centralized government, although it can make far-reaching education decisions, must compete for funds with numerous other programs. Even in a highly centralized government education decisions are not made in isolation; instead, such a government would have a national program budget composed of perhaps two dozen major programs. (One such national program budget has been presented elsewhere.[1])

It is important to realize that on the level of the Prime Minister or President tradeoffs are seldom made between education, defense, health, and other major programs. Instead, most tradeoffs are made on the sub-subprogram level, between sub-subprograms within the same program or cutting across program lines.

Under political and fiscal federalism the construction of a program budget becomes even more difficult. First, there are more decision-making units, many of which impinge upon one another. Thus education program budgets must be tailored to suit local, state, and Federal decision makers. In preparing state or local education program budgets, we must be cognizant that education decisions by one government unit can be conditioned by legal constraints and subsidies of higher levels of government. For example, in the United States the local school authority, insofar as primary and secondary education is concerned, is either an independent school district or part of a municipal government. The state often requires that the local school authority offer certain courses and engage in certain activities in return for state subsidies. Funds for such subsidies are often made available to the state by the Federal government, not infrequently with strings attached.

The state or Federal government may offer funds to the local school authority on the condition that the authority match the funds offered. Thus the authority may find that it is not free to spend for its own purposes all the funds it has itself raised but must keep part of those funds in a reserve for purposes of matching.

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[1] Werner Z. Hirsch, "Toward Federal Program Budgeting," *Public Administration Review*, Vol. 26, No. 4, December 1966.

In many countries the relative desirability of block grants and categorical grants by higher levels of government to local school authorities is now being thoughtfully debated. Rather than a detailed examination of the pros and cons of each of these types of subsidy, we offer a few comments on the programmatic effects of each. Block grants, which can be used in any way the local authority chooses, indicate that the granting agency believes it can rely on the local authority to use the funds effectively, and gives the local unit flexibility to plan and manage its own enterprise. Categorical grants, which are subject to conditions specified by the higher level of government, enable the higher level of government to maintain control over the expenditure of the funds and are consistent with the philosophy of fiscal federalism.

The program budget of a local school authority should include information on such revenue sources as tax receipts and subsidies, preferably by specific subprograms, activities, target groups, and so on. One highly aggregated example, for the State of California for the fiscal year 1963, isgiven in Appendix A. Appropriations are broken down in terms of their use by the State: for current and capital expenditure and assistance to local school boards.

A Multiyear Program Budget

To be useful a program budget must have an adequately long time horizon. A simple projection of the most recent budget is insufficient.[2] Instead, just as the program budget for this year should reflect commitments resulting from a careful consideration of alternatives, a budget for future years requires a view of the world of tomorrow, an evaluation of the pros and cons of alternative programs and activities, the selection of the most desirable ones, and assessment of implications of each year's decisions on future resource use. Thus the ideal program budget for a given year assumes that major analytical studies have been carried out and used to determine the detailed budget. A multiyear program budget assumes furthermore that such analytical studies have been carried out for a sequence of years and that based on these studies a set of preferred programs has been selected and their annual cost implications have been projected into the future.

These analytic studies are incorporated in a program memorandum, which provides the analytic backup for the subprograms and the sub-subprograms incorporated in the multiyear budget, ideally stated in terms of resource and monetary cost as well as output. Program memoranda should serve as basic planning documents not only for top management but throughout the education enterprise. Moreover, they should be regularly updated to provide current statements of objectives, programs, costs, and output.

A few words should be said about what data we like to place in a multiyear program budget. Of course, we are interested in monetary figures. We would like to have not only agency cost data but some information on social costs; however, social cost data are very seldom available. As a matter of fact, we seldom have even agency cost data but must use instead either expenditure or obligational authority data. Capital and current cost or expenditure data should be given separately, whenever possible, for better understanding of the timing or implications of education decisions and guidance in bond issuance and taxation policies. In addition to this, which we call the multiyear financial program, we would like to have a physical program: separate tables prepared to include information on the projected resource requirements -- number of personnel required for each year of the plan, classroom and other space requirements, etc.

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[2] For an interesting attempt at projecting expenditures see Selma J. Mushkin and Gabriella C. Lupo, "Project 70: Projecting the State-Local Sector," *Review of Economics and Statistics*, Vol. XLIX, No. 2 (May 1967).

Finally, we would like to point to the need for a multiyear output statement, which should give some indication of the products implied by the decisions. Since measurement of education output is extremely difficult, some proxies will be required. The proxies for primary, secondary, and higher education might be the number of graduates with specified achievements, possibly broken down by target groups. Library services output may be approximated by the number of books circulated.

This brings us to a discussion of multiyear program budget projection models. The options open to education, particularly in such an intermediate length period as the next five years, are not as many or as great as one would sometimes like. All too often merely small changes are possible. However, under such circumstances it is somewhat easier to build a program budget projection model. The model should include the following parameters, among others: staff and staff wages and salaries; facilities and their construction costs; physical plant and the costs of maintaining and operating it; library books and their prices; etc. These parameters are basically related to the number of students to be educated, quality of education, nature of the staff needed, subject matters to be taught, scheduling and size of classes, scheduling of students in other facilities, book requirements, nature of the education process, etc.

A simplified multiyear program budget projection model will assume that a set of preferred programs has been agreed upon and relevant, reasonably stable coefficients are known. Such a model will be outlined with the aid of an example, a ten-year plan for the University of California./3/

The illustrative model is summarized in Chart I. It assumes that key policy decisions are made, preferably on the basis of analytical studies about future student-staff ratios, space requirements per student, etc. *(See Chart I, p. 102.)*

The basic point of departure of this projection model is enrollments a) on four levels of the University: lower division; upper division; masters and first-stage doctoral; and second-stage doctoral; and b) by schools and disciplines. Fourteen programs, such as instruction and departmental research, summer sessions, teaching hospitals, and organized research, are identified; they are shown in Appendix B. Virtually all projected resource and money requirements are derived - directly or indirectly - from projected enrollment figures. All program costs are stated in current (1966-67) prices and salaries and may be updated each year. Faculty requirements are derived directly from student-faculty ratios. Space requirements are derived from numbers of students and faculty-space ratios. Requirements for maintenance and operation of plant are derived

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/3/ This is to say not that the University of California used this model, but instead that a simplified model can be demonstrated with the aid of a document, "University Fiscal Program 1966-67 to 1975-76," prepared by the Office of the President for the Regents of the University of California. Only specific parts of the document are used and in a manner helpful to the purpose of illustration.

from the projected space requirements. Research requirements of organized research institutes, centers, and bureaus are based on the 1966-67 average expenditure per full-time equivalent faculty (FTE). Requirements of University Extension are based on projected enrollments and fee income and those of libraries are related to weighted enrollment and staff, with work load relationships on each campus based on current University experience.

Specifically, full-time equivalent (FTE) student enrollments are projected to increase from 73,677 students in 1965-66 to 139,700 in 1975-76. This 90% increase includes a noticeable trend toward greater enrollments at the upper division and graduate levels, resulting in a 107% increase on a weighted basis.[4] General campus as well as medical and health sciences enrollment projections are prepared by these four levels.

Key elements of the physical plan are derived from the enrollment projections. For example, FTE academic and nonacademic staff is projected in terms of fourteen major programs, as shown in Appendix B. New faculty positions are based on progression toward attaining a 28 to 1 student-instructor ratio in conformance with the University growth plan, taking into consideration size and maturity of campus programs. Total FTE academic and nonacademic staff is projected to increase 141% from 37,221 in 1965-66 to 89,668 in 1975-76.[5] Tenure positions in 1975-76 would represent 50.5% of the total faculty, up slightly from 47.5% in 1966-67, with the result that average faculty salaries would increase from $13,129 in 1966-67 to $14,230 (at 1966-67 salary rates) in 1975-76.

In addition to the staff program budget for the entire University presented here, staff programs have been prepared for each major facility, on campus or elsewhere. A ten-year space requirement plan has also been prepared for each campus location and the University headquarters. The expansion program can be summarized as follows: During the ten-year period buildings constructed and occupied will increase space from 18.9 to 43.4 million square feet, a 130% increase.

Let us next present some financial aspects of the ten-year program budget. Expenditures for current operations would increase from $425 million in 1965-66 to $1.0 billion in 1975-76, a 135% increase. Expenditure projections by major programs are given in Appendix C. Total current expenditures for general instruction and departmental research are projected to increase 112% from $94.6 million in 1965-66 to $201 million in 1975-76.

Capital outlay requirements during the ten-year period will average approximately $80 million a year from state sources and $150 million from all sources.

Organized research expenditures are projected to increase 162% from $123.1 million in 1965-66 to $322.6 million in 1975-76. State funds are expected to increase 58%, Federal funds 210% and other funds 124%.

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[4] For the lower division; upper division; masters and first-stage doctoral; and second-stage doctoral levels the weights are 1.0, 1.5, 2.5, and 3.5, respectively.

[5] Three major contracts with the Atomic Energy Commission are excluded.

Library expenditures are projected to increase from \$15.3 million in 1965-66 to \$25.9 million in 1975-76, a 69% increase. To handle the additional library uses and acquisitions, an additional 433 FTE professional librarians will be needed by 1975-76, a 105% increase.

Concerning maintenance and operating plant expenditures, it is important to remember that buildings scheduled for construction and occupancy will increase space by 130%. As a result the total of such expenditures will increase 155% from \$18.9 million in 1965-66 to \$48.2 million in 1975-76. Based on 1966-67 dollars, unit operating support will rise from \$.95 to \$1.11 per square foot, a 17% increase, to provide for the added costs of year-round operations, upgrading of all the buildings to meet modern standards, and improvement of maintenance capabilities, as well as the increased utilization of facilities./6/

Finally, income and funds available are projected by major sources; the data are shown in Appendix D. State of California funds are projected to double in the ten-year period, Federal funds to increase 209%, student fees to increase 136%, and other income to increase 162%. State support, as a percentage of total income and funds available, will decline, from about 49% in 1965-66 to 40% in 1975-76, while Federal funds will increase, from about 26% to 32% of the total in the same period. Specifically, state support would increase from \$208 million in 1965-66 to \$415 million in 1975-76. State support for current operations as a percent of California personal income would increase from .35% in 1965-66 to .39 in 1975-76. As a percentage of state general fund revenues, state support for current operations for the University would increase from 8.2% in 1965-66 to 8.7% in 1975-76.

Ideally we would want to transform this simplified model into a rigorous general equilibrium model, preferable in equation form, which would permit policy variables, and therefore coefficients, to be varied explicitly and simultaneously and their appropriateness to be judged in terms of overall performance criteria. Policy variables could then be manipulated to determine a preferred set of programs and to estimate their budget implications for a future period. Such a model would give expression to the interdependence of crucial variables and would help to estimate costs, which in turn would be compared with separately estimated benefits. Tradeoff analyses could be made in relation to such variables as different class sizes, changes in the existing single salary schedule, alternative frequencies of the use of facilities during the day and the week, and different policies to reduce dropouts and increase the speed with which students gain degrees. Such tradeoff analyses should be made assuming each of various salary and price levels in the future. To the best of my knowledge work along these lines has only begun, and how successful and fruitful the work turns out remains to be seen./7/

Two separate questions could be asked in this connection: "What are the costs and benefits associated with changing coefficients, for example, students per instructor?"

/6/ The University of California is shifting from two semesters and three summer months off, to a four quarter system.

/7/ One interesting effort can be found in Richard J. O'Brien, School Submodel for Large Urban Schools, Technical Note 38, National Center for Educational Statistics, U.S. Office of Education, 1967.

and "What are the costs of changing the quantity or quality of key outputs which may involve changes in such coefficients as students per instructor?"[8] The parallel in conventional economic theory is that between asking about 1) costs and benefits of changing one input factor in a production function and 2) costs associated with an increase in output of specified magnitude. The differences between the two approaches can be negligible for very small changes but important for large changes. However, serious difficulty may be encountered in the first approach if optimum coefficients of other policy variables do not remain constant when the one under consideration changes.

Finally, let us turn to statements of the future output of education. Such statements related to instruction are very hard to make and related to research are virtually impossible. However, tables can be prepared of the number of students graduated in different disciplines and with different achievements. This information is superior to enrollment figures. For example, it costs the State of California $7,140 in the University of California and $5,800 in the State College system to give a student a four-year education. Clearly, the quality of the education differs. Furthermore, 55% of the students who enter the University graduate after 4 years, compared with 50% of those who enter the State Colleges. Thus 1,818 students must enter if 1,000 of them are to graduate from the University of California, while 2,000 must enter the Colleges. Therefore, about $9,210 in subsidy will be required to graduate a student from the University and about $7,730 from the Colleges.

Such output information should help in some tradeoff analyses. Important issues are: Is it efficient to have many students work while in college? How high are the capital and operating expenditures per student, if a bachelor degree is obtained in 3½, 4, or 5 years? Can incentives be devised to expedite the education process and do gains from them exceed their costs?

Conclusions

The program budget is a promising tool for planning and managing the education enterprise, particularly if it is used in conjunction with thoughtful analysis to assist in the design, development, and consideration of alternative approaches to education.

It should be clear, however, that program budgeting of education is in an early stage of development and that it presents more severe difficulties than did defense planning, where programe budgeting was pioneered. Among the complicating factors are: education in many countries is a cooperative effort between numerous governments, and thus complicated inter-governmental fiscal relations often prevail; unlike defense, where obsolescence requires that entirely new capital investments be made every five to ten years, education facilities and equipment are merely undergoing minor changes; the quantification of outputs and even of certain human inputs, is extremely difficult; and unlike those of an air force or space agency, most activities of education are multipurpose.

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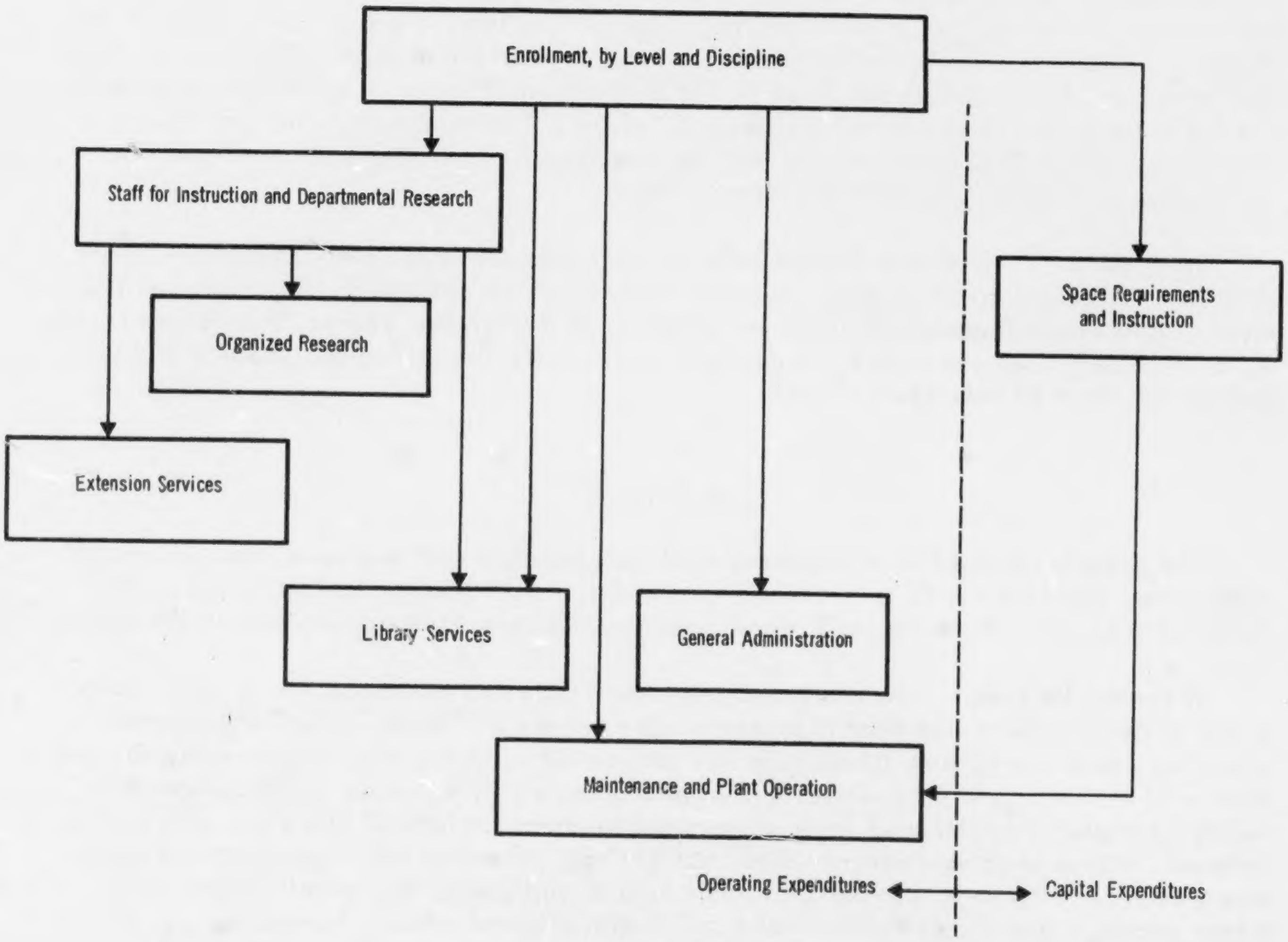
[8] This issue was brought to my attention by Bryan C. Conley of the Institute of Government and Public Affairs, UCLA.

In spite of these great difficulties, program budgeting can make a major contribution to better planning of the education enterprise. As Alain C. Enthoven has stated:

> "Ultimately, policy decisions will be based on judgments about relative values, the likelihood of certain future events, which risks we should and should not run, etc. But ... good analysis can do a great deal to sharpen the issues, clarify the alternatives available to the decision makers and narrow substantially the range of uncertainties, thus freeing the responsible officials to concentrate their attention on the crucial judgments." [9]

Chart I

UNIVERSITY OF CALIFORNIA PROGRAM BUDGET PROJECTION MODEL


Enrollment, by Level and Discipline
Staff for Instruction and Departmental Research
Organized Research
Extension Services
Space Requirements and Instruction
Library Services
General Administration
Maintenance and Plant Operation
Operating Expenditures
Capital Expenditures

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[9] Special Subcommittee on the Utilization of Scientific Manpower, Senate Labor and Public Welfare Committee, 89th Congress, Second Session, May 17, 1966.

APPENDIX A

EDUCATION PROGRAM BUDGET FOR THE STATE OF CALIFORNIA

FISCAL YEAR 1963

(appropriations in millions of dollars)

	Current	Capital	Local Assistance	Total[1]
Total	258.0	116.0	857.1	1,231.1
General Programs	255.7	116.0	857.1	1,228.8
Child-care	--	--	--	--
Primary and secondary	19.2	.2	857.1	876.5
Higher education	236.5	115.8	--	352.4
Special Groups	.1	--	--	.1
Adult education	.1	--	--	.1
Physically handi-capped	n[2]	n	n	n
Mentally retarded	n	n	n	n
Juvenile offenders	n	n	n	n
Libraries	1.2	--	--	1.2
Research	--	--	--	--
Unallocated	1.0	--	--	1.0

[1] Details may not add to total because of rounding.

[2] (n) designates sums less than $50,000.

Source: State of California Budget, 1962-63 (State Printing Office).

APPENDIX B

STAFF PROGRAM BUDGET OF THE UNIVERSITY OF CALIFORNIA 1963-64 TO 1975-76

	ACTUAL			TOTAL FTE POSITIONS BY PROGRAM									
	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
INSTRUCTION AND DEPARTMENTAL RESEARCH - GENERAL													
ACADEMIC	4,490	5,144	6,165	6,673	7,137	8,075	8,704	8,145	9,541	9,979	10,374	10,774	11,197
NONACADEMIC	1,993	2,248	2,835	3,075	3,422	4,057	4,475	4,694	4,879	5,097	5,392	5,578	5,832
TOTAL	6,483	7,392	9,000	9,748	10,599	12,232	13,179	13,859	14,420	15,076	15,703	16,352	17,029
INSTRUCTION AND DEPARTMENTAL RESEARCH - HEALTH SCIENCES													
ACADEMIC	980	1,025	1,086	1,091	1,240	1,400	1,588	1,738	1,910	2,094	2,257	2,416	2,539
NONACADEMIC	708	770	967	1,359	1,590	1,805	2,055	2,299	2,571	2,855	3,111	3,336	3,516
TOTAL	1,688	1,795	2,053	2,450	2,830	3,205	3,643	4,037	4,481	4,949	5,368	5,752	6,055
SUMMER SESSIONS													
ACADEMIC	242	272	298	264	153	91	76	67	67	69	69	71	71
NONACADEMIC	29	39	42	48	43	21	18	17	17	17	17	17	18
TOTAL	271	311	340	312	196	112	94	84	84	86	86	88	89
TEACHING HOSPITALS													
ACADEMIC	107	120	57	185	205	234	247	259	379	393	408	423	442
NONACADEMIC	2,989	3,017	3,223	4,896	5,318	6,041	6,394	6,772	10,408	10,822	11,252	11,700	12,164
TOTAL	3,096	3,137	3,280	5,081	5,523	6,275	6,641	7,031	10,787	11,215	11,660	12,123	12,606
ORGANIZED ACTIVITIES													
ACADEMIC	90	84	89	111	123	154	175	191	208	226	245	270	290
NONACADEMIC	371	371	383	418	470	534	588	634	678	724	763	802	835
TOTAL	461	455	472	529	593	688	763	825	886	950	1,008	1,072	1,125
ORGANIZED RESEARCH - GENERAL													
ACADEMIC	2,491	2,813	2,849	3,556	3,881	4,402	4,885	5,320	5,757	6,298	6,839	7,406	8,041
NONACADEMIC	4,389	4,760	5,333	6,097	6,537	7,553	8,354	9,067	9,760	10,599	11,498	12,428	13,463
TOTAL	6,880	7,573	8,128	9,653	10,418	11,955	13,239	14,387	15,517	16,897	18,337	19,834	21,504
ORGANIZED RESEARCH - HEALTH SCIENCES													
ACADEMIC	751	828	770	998	1,110	1,327	1,478	1,614	1,755	1,924	2,098	2,288	2,506
NONACADEMIC	520	573	810	840	964	1,328	1,509	1,709	1,940	2,242	2,484	2,766	3,110
TOTAL	1.271	1.401	1,580	1,838	2,074	2,655	2,987	3,323	3,695	4,166	4,582	5,054	5,616
LIBRARIES													
ACADEMIC	364	382	413	594	539	594	632	670	708	743	780	813	846
NONACADEMIC	841	907	1,075	1,112	1,261	1,389	1,472	1,553	1,628	1,703	1,778	1,843	1,913
TOTAL	1,205	1,289	1,488	1,616	1,791	1,983	2,104	2,223	2,336	2,446	2,558	2,656	2,759
EXTENSION & PUBLIC SERVICE													
ACADEMIC	1,286	1,399	899	1,120	1,190	1,259	1,324	1,381	1,438	1,499	1,562	1,620	1,683
NONACADEMIC	827	902	1,558	1,977	2,192	2,421	2,649	2,830	3,004	3,207	3,402	3,597	3,804
TOTAL	2,113	2,301	2,457	3,097	3,382	3,680	3,973	4,211	4,442	4,706	4,964	5,217	5,487
MAINTENANCE & OPERATION OF PLANT													
ACADEMIC													
NONACADEMIC	1,873	2,034	2,325	2,797	2,938	3,454	3,840	4,214	4,694	4,998	5,170	5,483	,829
TOTAL	1,873	2,034	2,325	2,797	2,938	3,454	3,840	4,214	4,694	4,998	5,170	,483	5,829
GENERAL ADMINISTRATION													
ACADEMIC													
NONACADEMIC	1,250	1,424	1,611	1,767	1,981	2,281	2,440	2,589	2,802	2,959	3,126	3,311	3,487
TOTAL	1,250	1,424	1,611	1,767	1,981	2,281	2,440	2,589	2,802	2,959	3,126	3,311	3,487
STUDENT SERVICES													
ACADEMIC													
NONACADEMIC	1,086	1,215	1,422	1,579	1,771	1,905	2,013	2,107	2,184	2,276	2,361	2,438	2,507
TOTAL	1,086	1,215	1,422	1,579	1,771	1,905	2,013	2,107	2,184	2,276	2,361	2,438	2,507
INSTITUTIONAL SERVICES & GENERAL EXPENSE													
ACADEMIC													
NONACADEMIC	1,212	1,298	1,475	1,580	1,640	1,744	1,833	1,934	2,108	2,249	2,362	2,493	2,644
TOTAL	1,212	1,298	1,475	1,580	1,640	1,744	1,833	1,934	2,108	2,249	2,362	2,493	2,644
AUXILIARY ENTERPRISES													
ACADEMIC													
NONACADEMIC	1,461	1,541	1,536	1,696	1,785	1,918	2,059	2,103	2,208	2,400	2,453	2,811	2,931
TOTAL	1,461	1,541	1,536	1,696	1,785	1,918	2,059	2,103	2,208	2,400	2,453	2,811	2,931
TOTAL FTE POSITIONS													
ACADEMIC	10,801	12,067	12,626	14,502	15,569	17,536	19,109	20,385	21,763	23,225	24,632	26,081	27,615
NONACADEMIC	19,549	21,099	24,595	29,422	31,912	36,551	39,699	42,522	48,881	52,148	55,106	58,603	62,053
TOTAL	30,350	33,166	37,221	43,924	47,481	54,087	58,808	62,907	70,644	75,373	79,738	84,684	89,668

APPENDIX C

FINANCIAL PROGRAM BUDGET OF THE UNIVERSITY OF CALIFORNIA 1963-64 TO 1975-76

Total Expenditures for Current Operations, in 1966-67 thousands of dollars

	ACTUAL												
	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1971-71	1971-72	1972-73	1973-74	1974-75	1975-76
BY PROGRAM													
INSTRUCTION & DEPT RES - GEN	66,808	76,993	94,586	109,587	119,262	137,140	148,948	157,727	165,541	174,463	182,892	191,555	200,522
HEALTH SCI	16,155	18,070	22,117	26,912	30,808	36,229	41,187	45,655	50,676	55,914	60,509	64,528	67,691
TOTAL	82,963	95,063	86,703	136,499	150,070	173,369	190,135	203,382	216,217	230,377	343,401	256,083	268,213
SUMMER SESSION	1,782	2,024	2,214	2,156	1,396	796	675	609	615	621	629	637	642
TEACH HOSPITAL	21,944	23,418	25,926	38,780	42,577	48,766	51,625	54,633	84,265	87,634	91,138	94,782	98,570
ORG ACTIVITIES	3,347	3,450	4,267	4,913	5,733	6,688	7,415	8,018	8,581	9,171	9,687	10,184	10,641
ORG RESEARCH-GEN	50,578	59,185	73,912	84,478	94,854	110,020	123,903	136,241	148,215	163,619	178,742	194,853	212,844
AGRICULTURE	22,842	23,366	24,984	26,383	27,089	27,816	28,562	29,340	30,138	30,964	31,814	32,655	33,558
HEALTH SCI	19,016	20,195	24,248	26,901	30,081	36,680	41,088	45,558	50,488	56,278	62,323	68,628	76,230
TOTAL	92,436	102,746	123,144	137,762	152,024	174,516	193,553	211,139	228,841	250,861	272,879	296,136	322,632
LIBRARIES	12,039	12,905	15,304	17,257	18,926	20,623	21,400	22,184	23,012	23,807	24,604	25,252	25,927
EXT & PUB SERV	25,536	27,771	31,405	40,179	43,712	47,848	51,586	54,674	57,593	61,067	64,348	67,617	71,065
M & O PLANT	13,717	16,137	18,870	21,816	23,885	27,758	31,284	34,646	37,638	40,502	42,080	44,969	48,230
GENERAL ADMIN	9,233	10,434	12,242	13,520	14,913	17,910	19,196	20,318	21,994	23,299	24,515	25,804	27,190
STDT SERVICES	9,781	11,757	14,079	15,730	17,743	19,262	20,412	21,428	22,272	23,266	24,165	25,035	25,946
STAFF BENEFITS	13,650	14,955	17,195	21,830	24,526	27,353	29,979	32,307	35,815	38,555	41,093	43,713	46,530
IN-SERV-GEN-EXP	4,898	5,805	7,442	6,807	7,515	9,198	10,012	10,739	11,958	12,789	13,504	14,343	15,198
AUX ENTERPRISES	16,959	20,698	23,051	24,737	26,372	27,953	20,641	32,119	34,121	37,767	39,744	42,958	46,063
STUDENT AID	8,995	11,063	13,530	15,705	17,401	19,082	20,692	22,192	23,629	25,187	26,703	28,240	29,837
TOTAL EXPENDITURES	317,279	358,226	425,372	497,691	544,310	621,122	678,605	728,388	806,551	846,903	918,490	975,753	1036,684
BY OBJECT													
SALARIES													
ACADEMIC	103,683	116,481	131,482	155,623	168,808	191,175	208,639	223,263	238,661	255,311	270,904	286,680	303,067
NONACADEMIC	114,337	128,656	156,474	179,665	196,749	225,602	245,202	262,949	300,060	320,648	339,449	359,928	381,664
TOTAL	218,020	245,137	287,956	335,288	365,557	416,777	453,841	486,212	538,721	575,959	610,353	646,608	684,731
OTHER	99,259	113,089	137,416	162,403	181,236	204,345	224,764	242,176	267,830	288,944	308,137	329,145	351,953
TOTAL EXPENDITURES	317,279	358,226	425,372	497,691	546,793	621,122	678,605	728,388	806,551	864,903	918,490	975,753	1036,684

APPENDIX D

SOURCES OF FUNDS FOR CURRENT OPERATIONS OF THE UNIVERSITY OF CALIFORNIA 1963-64 TO 1975-76

in 1966-67 thousands of dollars

	ACTUAL												
	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Student Fees:													
Incidental	8,704	10,763	12,935	14,270	16,762	18,949	20,633	22,122	23,392	24,615	26,139	27,412	28,666
Nonresident	3,405	4,146	6,230	8,577	9,840	10,981	12,079	12,941	13,675	14,379	15,264	16,000	16,726
Summer Session	1,782	2,024	2,108	2,156	1,451	854	757	700	735	771	814	854	899
University Extension	9,797	10,630	11,329	13,225	14,111	16,799	19,230	20,325	22,043	23,986	25,758	27,633	29,443
All Other	1,527	1,502	2,415	3,028	3,447	4,064	4,422	5,058	5,496	5,906	6,344	6,707	7,051
State of California:													
General Support	157,705	178,089	204,946	239,955	242,986	301,708	317,860	334,742	361,230	380,924	397,276	413,603	421,268
Restricted	2,253	2,565	2,969	3,174	3,271	3,377	3,471	3,551	3,628	3,698	3,757	3,817	3,857
Prior Yr. O'head on Fed. Funds	5,906	3,959	6,092	7,542	7,836	10,144	10,985	12,979	14,357	15,774	17,498	19,291	21,214
United States of America	72,675	83,382	106,170	118,190	131,766	151,833	179,064	197,819	217,006	240,214	264,242	289,918	328,454
Endowments	6,108	7,110	9,232	10,470	10,901	11,557	12,414	13,831	15,023	15,991	16,705	17,770	18,645
Gifts and Private Grants	8,686	9,865	11,239	12,708	13,480	14,135	14,750	15,696	16,119	16,279	16,211	16,272	16,208
Sales and Services--Educ. Depts.	1,475	1,811	1,662	1,911	2,049	2,243	2,487	2,863	3,214	3,538	3,723	4,109	4,574
Organized Activities--Educ. Depts.:													
Teaching Hospitals	15,093	16,479	18,589	29,780	32,315	37,708	40,387	43,202	65,626	6 ,992	72,491	76,132	79,919
Other	2,518	2,684	3,538	4,069	4,362	4,777	5,295	6,095	6,842	7,531	8,039	8,766	9,639
Auxiliary Enterprises	16,009	19,880	22,216	24,737	26,378	27,956	30,650	32,107	34,146	37,803	39,792	43,018	46,135
Other Sources	3,636	3,337	3,702	3,899	25,838	4,037	4,121	4,357	4,019	4,502	4,437	4,451	3,986
TOTAL EXPENDITURES	317,279	358,226	425,372	497,691	546,793	621,122	678,605	728,388	806,551	864,903	918,490	975,753	1,036,684

LE BUDGET : OUTIL DE PLANIFICATION ET DE PROGRAMMATION DE L'ENSEIGNEMENT A MOYEN ET A LONG TERME

par Werner Z. Hirsch (Résumé)

Planification et budgétisation

Par la planification de l'enseignement, nous visons à : parcourir l'horizon pour y découvrir ce que l'avenir ou plusieurs possibilités d'avenir peuvent apporter, identifier les objectifs et les responsabilités qui se modifient, attirer l'attention sur les domaines qui présenteront vraisemblablement des problèmes ou des déséquilibres potentiels, et prévoir des possibilités de solution pour les problèmes qui pourraient se présenter. Lorsque les objectifs, les possibilités, les problèmes, les solutions concevables de l'entreprise "enseignement" ont été ainsi identifiés, le deuxième but de la planification est de contribuer à évaluer les mérites relatifs des différentes solutions. Les variantes d'action sont analysées et les politiques évaluées de telle sorte que l'on puisse choisir les solutions en harmonie avec les objectifs et les possibilités.

Pour que la planification donne lieu à exécution, le processus de planification ne doit pas se terminer par la préparation d'une série de recommandations ou de plans préparés hors du contexte des programmes qui serviront à l'exécution. Le mécanisme d'exécution comprend la préparation des programmes (tant au point de vue physique que financier) qui, en définitive, seront inscrits au budget. Un budget bien conçu doit présenter les évaluations de coût d'exécution des programmes recommandés pendant un certain nombre d'années. Le budget devrait être un plan examiné annuellement et révisable si nécessaire à la lumière des politiques d'exécution. Dans ce sens, le budget représente un engagement de la part des autorités éducatives pour allouer des ressources limitées à des activités spécifiques afin d'obtenir des objectifs spécifiés. Il serait préférable que des évaluations d'output accompagnent le budget.

Il est essentiel que les processus de planification et de budgétisation soient étroitement reliés. Puisque de nombreux programmes intéressent à la fois différents secteurs de l'organisation de l'enseignement, il est important de préparer un plan qui indique qui sera responsable d'apporter telle ou telle contribution à la réalisation de l'objectif d'ensemble. Quand un plan est préparé pour couvrir un large domaine, par exemple l'ensemble du système éducatif, ce plan intéresse un grand nombre de services administratifs et, en essence, il devient donc un mécanisme de coordination.

Le budget de type traditionnel a évolué au cours des ans ; il répondait essentiellement au désir de préserver les fonds budgétisés contre l'incurie et la malhonnêteté. En conséquence, le budget traditionnel de type administratif, ne permet pas d'établir un lien entre, d'une part, les ressources nécessaires et les coûts et, d'autre part, les outputs objectifs spécifiques que l'on veut atteindre. Le budget traditionnel n'est donc pas un outil fondamental de planification et de direction du système éducatif. Il est principalement centré sur des rubriques individuelles telles que le personnel, les équipements, l'électricité, etc. Il s'agit davantage d'un budget pour contrôleur financier que d'un budget de direction.

Le budget programmé est orienté vers l'output. Il permet de rassembler les activités de plusieurs départements et de plusieurs services sous forme de groupes spécifiques d'output ; c'est-à-dire programmes primaires à différents niveaux appropriés d'agrégation. Par exemple, nous pouvons sélectionner quelques outils de politique qui permettront d'atteindre l'objectif de mise en valeur des ressources humaines que nous nous sommes fixé. C'est ainsi, par exemple, qu'il faudra prendre des décisions d'affectation des ressources, entre un programme de recyclage professionnel pour donner de nouvelles qualifications à la main-d'oeuvre et un programme d'enseignement universitaire pour améliorer le niveau des contributions de recherche, scientifiques et artistiques. Ces deux programmes sont en concurrence l'un et l'autre en ce qui concerne les ressources. Chacun d'eux est composé de programmes primaires optionnels qui, en tant qu'inputs permettant de réaliser les objectifs spécifiques des programmes, sont également en concurrence à l'égard des ressources.

Structuration du budget programmé

Nous sommes parfaitement conscients qu'il n'est pas facile de relier directement les différents niveaux des programmes d'enseignement aux objectifs et aux aspirations des individus et à ceux du pays. D'une façon générale, nous considérons que l'enseignement a pour objectif la préparation des individus en vue d'un emploi rentable, d'un revenu suffisant, d'une utilisation effective de ses loisirs, de relations familiales efficaces, de l'accomplissement de ses responsabilités civiques et sociales au sein de la société, etc. Bien que nous puissions nous entendre sur ces finalités générales de l'enseignement, il est difficile d'isoler les activités d'enseignement qui contribuent exclusivement à la réalisation de l'un ou de l'autre de ces objectifs. On fait face également à quelques sérieux problèmes d'ordre conceptuel et empirique lorsque l'on traite des programmes primaires d'enseignement de cette nature.

En raison des très nombreux problèmes qu'un budget programmé devrait élucider, sans nul doute nous aimerions construire - ce qui serait l'idéal - une matrice à plusieurs dimensions. Essayons d'expliquer ce besoin dans le domaine de l'enseignement primaire et secondaire. Nous pourrions, par exemple, analyser l'enseignement primaire et secondaire sous forme des programmes de base suivants : amélioration des facultés individuelles, amélioration des qualifications professionnelles, amélioration des qualités physiques de l'individu et amélioration de la qualité de la vie. Il est évident qu'il y aura des doubles emplois ; par exemple, la connaissance par un individu de sa propre langue peut servir plusieurs objectifs.

Les bénéficiaires ou groupes visés constituent une autre dimension de la matrice. On s'est souvent posé la question de savoir quelles ressources il faudrait affecter à l'enfant doué par rapport à celui qui apprend mal. Il y a, d'autre part, les enfants qui sont physiquement handicapés et ceux qui sont mentalement retardés. Les groupes socio-économiques sont importants et dans certains pays la race joue un rôle primordial. Enfin, du point de vue du gouvernement du pays, il faut prendre des décisions difficiles en ce qui concerne les régions géographiques qui doivent être soit favorisées, soit pénalisées dans le domaine de l'enseignement primaire et secondaire.

Un budget pluri-annuel programmé

Pour jouer son rôle, un budget programmé doit avoir l'horizon à long terme qui lui convient. Un budget pour les années à venir exige une vision du monde de demain, une évaluation des avantages et des inconvenients des variantes de programmes et d'activités, la sélection des programmes et des activités les plus désirables, et une évaluation des conséquences des décisions d'une année particulière sur l'utilisation future des ressources. En conséquence, des études analytiques essentielles doivent être entreprises. Il faudrait les incorporer dans un memorandum de programmation à mettre à jour régulièrement pour fournir des données actualisées sur les objectifs, les programmes, les coûts et l'output.

Dans un budget programmé pluri-annuel, nous sommes intéressés, bien entendu, par l'aspect monétaire. Nous voudrions connaître non seulement les données de coût par organisme de gestion, mais également les données concernant les coûts sociaux. Les coûts en capital et les coûts généraux, c'est-à-dire les données de dépenses, devraient être indiqués séparément, lorsque c'est possible, afin d'obtenir une meilleure compréhension du moment auquel les décisions en matière d'enseignement devraient être prises, et de leurs conséquences ; et, afin d'être guidés dans les politiques en matière d'émission d'emprunt et de taxation. Outre ce que nous appelons le programme financier pluri-annuel, nous aimerions disposer d'un programme exprimé en termes physiques : il comporterait des tableaux séparés présentant des données sur les besoins en ressources, l'effectif de personnel nécessaire pour l'exécution annuelle des plans, les besoins en salles de classe et autres installations, etc.

Ceci nous amène à examiner des modèles de projection de budgets programmés pluri-annuels. Un tel modèle devrait comprendre entre autres les paramètres suivants : personnel, salaires et traitements du personnel, bâtiments et coûts de construction, matériel général et coûts d'entretien et de fonctionnement, livres de la bibliothèque et leurs prix, etc. Ces paramètres dépendent essentiellement du nombre des élèves qu'il faudra former, de la qualité de l'enseignement qu'on leur donnera, de la nature du personnel nécessaire, des matières que l'on enseignera, de l'emploi du temps des classes et du nombre d'élèves par classe, de l'emploi du temps des étudiants dans d'autres activités, des besoins en livres, de la nature du processus éducatif, etc.

Un modèle de projection d'un budget programmé pluri-annuel suppose que l'on se soit entendu sur une série de programmes préférentiels.

L'étude présente, à titre d'exemple, un modèle de ce type. Il s'agit du plan de dix ans de l'Université de Californie.

Des prévisions quant à l'output futur du système éducatif en ce qui concerne le niveau d'instruction sont très difficiles à faire ; et pour ce qui est de la recherche, elles sont virtuellement impossibles. Toutefois, on peut préparer quelques tableaux concernant le nombre des diplômés dans différentes disciplines aux différents niveaux. De telles données d'output devraient faciliter nos analyses globales. Parmi les problèmes importants, on citera les suivants : est-il efficace que beaucoup d'étudiants aient un emploi lorsqu'ils ont atteint le niveau de l'enseignement universitaire ? Quelles sont les dépenses en capital et de fonctionnement, par étudiant, si le grade de "bachelor" est obtenu en trois ans et demi, en quatre ans ou en cinq ans ? Est-il possible de mettre au point des stimulants pour accélérer le processus d'enseignement ? Les gains qui résulteront de ces stimulants en excèderont-ils les coûts ?

PROGRAM BUDGETING AND COST-EFFECTIVENESS IN LOCAL SCHOOLS

by Harry J. Hartley

INTRODUCTION

The intent of this paper is five-fold: 1) to examine stages of budgetary reform in order to explain why program budgeting may replace the currently dominant incrementalism in local school planning; 2) to portray some of the conceptual and operational elements of PPBS; 3) to describe several illustrative program budgeting installations of local schools; 4) to discuss performance indicators which eventually may be used in cost-effectiveness analysis; and 5) to outline present limitations of the systems approach in local schools.

BUDGETARY REFORMS AND CURRENT INCREMENTALISM

Emergent procedural and allocative strategies which rely upon a systems approach to organizational planning are being used increasingly in the context of curricular and fiscal planning of local schools./1/ At a time when public aspirations and expectations of local schools appear to exceed public willingness and capacity to provide sufficient resources, a demand has grown for planning and budgetary reforms which will result in a greater emphasis upon displaying the programmatic, end-objectives of the schools. The major advantage of program budgeting over conventional approaches is that in the new format, greater attention is devoted to the outputs (however they are defined), or programmatic outcomes of a school, as compared to the inputs (objects purchased) which are necessary to support these programs.

Traditionally, the local budget has been viewed as a device for providing: 1) strong fiscal accountability and managerial control accountability to the public for its funds, and 2) control between and within the governmental agencies responsible for the expenditure of the appropriations. The budget used by local schools evolved as a consequence of the general governmental reform movement over the past fifty years or so. Thus, it is not surprising that the distinct stages of educational budget reform are nearly parallel to those of national budget reform in the United States.

Toward a Planning Orientation

Schick observed that American budgetary reform evolved through three distinct stages,/2/ and it is possible that similar patterns will take place among many of the twenty-one O.E.C.D.-member nations: 1) central control, 2) scientific management, and 3) planning-programming-budgeting systems (PPBS). Each of these approaches has different emphases, although the program budget is a product of converging elements of its predecessors. The first year of the United States budget was 1922, and the central control orientation was characterized by executive budgets which included a system of expenditure control to limit the discretion and abuses of administrators. In the mid-1930's, management-oriented budgets which focused upon efficient performance by workers were formulated; the budget was used less as a control device and more as an executive tool to assess work units and work-cost data. The third stage, or era, is represented by the planning orientation of the PPBS design. The conceptual bases for program budgeting may be traced to macroeconomics, Keynes' influence, capital theory, principles of marginal analysis, a desire to integrate budgeting with policy, and the contributions of the systems sciences to administration. It is likely that the three stages are additive, rather than discrete, and that the program budget combines elements of control, management and planning.

From Incrementalism to the Systems Approach

In any nation characterized by a decentralized educational system, it is to be expected that local school districts would develop a variety of budgetary requirements, procedures, and practices: "It can be concluded that budgetary practices in local school systems prior to 1920 were relatively undeveloped and nonstandardized."/3/

N.B.: Figures in square brackets refer to notes at the end of this document.

The budget of local schools evolved through the following relative stages of development: 1) the object budget; 2) the function-object budget; and 3) the program budget.

The object-of-expenditure budget consists of a listing of objects, such as salaries, supplies, equipment, contracted services, etc., without regard to their function. The function-object budget, which appeared prior to 1920, identifies costs under several broadly defined function and object categories, and then delineates these according to their component sub-divisions, both function and object, as sub-expenses.

The function-object budget is management-oriented and includes these kinds of broad categories: 1) Administration, 2) Instruction, 3) Plant Operation, 4) Plant Maintenance, 5) Auxiliary Agencies, 6) Fixed Charges, 7) Capital Outlay, and 8) Debt Service. Items 1 through 5 are function activities, whereas 6, 7 and 8 are objects of expense which cut across all functions. The function-object budget is the type used almost exclusively by local public schools, and it has fostered an incremental approach to educational planning. The primary basis for next year's budget is this year's budget, and the major difference between the two is likely to be only an increase in each of the conventional categories of a line-item budget. With structural congruence of two successive budgets, little attempt is made to evaluate the various programs; the budget is almost never reviewed by policy makers on a completely differentiated basis each year, in the sense of reconsidering the value of each existing program. Bundy, President of the Ford Foundation, stated the issue succinctly in his study of New York City Public Schools:

> Budget formulation now is incremental, fragmented and unprogrammatic .. budget requests are based on past expenditure plus increased student enrollment or for specific programs in particular schools. The budget is thus so fragmented that school headquarters has not been able to provide information on the actual expenditures for any individual school ... Thus, there exists now a system with little accountability to the public .. on the way it allocated resources to meet the educational needs of the city./4/

Incrementalism in educational planning appears to be giving way to a new approach comprising a number of techniques which fall under the rubric of systems analysis. In analyzing the evolving nature of educational planning and/or administration, it is apparent that the field has been influenced by at least six contrasting, dominant doctrines, or ideologies, which have determined the types of fiscal instruments to be used. The superintendent has been viewed, in historical sequence, as a Master of Pedogogy, a Moral Philosopher interested in applied philosophy, a School Executive who created a "cult of efficiency" in attempting to run schools as though they were factories, a Technical Expert who lost much of his original power and esteem, an Administrative Scientist and Human Relations specialist who was an applied behavioral scientist, and now as a Systems Analyst, who incorporates newly devised procedural strategies into the earthy reality of an educational system. Table 1 portrays the similarity in budgetary reforms of the national government and local school districts.

After reviewing most of the major contemporary research germane to educational organization, administration and finance, the 1967 committee chairman for this area of specialization for the American Educational Research Association concluded:

> ... the field is very much in flux. The earstwhile search for "administrative theory," for example, seems virtually abandoned today, though a few

TABLE 1

COMPARISON OF THE STAGES OF BUDGETARY REFORM IN THE FEDERAL GOVERNMENT OF THE UNITED STATES WITH THE DOMINANT ADMINISTRATIVE DOCTRINES AND BUDGET FORMATS USED BY LOCAL SCHOOL DISTRICTS

Federal Government Budget Reform			Local School Administration-Budget Reform			
Major Orientation	Approximate Period	Budgetary Intent	Dominant Doctrine of Administration	Approximate Period	Budget Format	Budgetary Intent
1. Control	1920 - 1935	Central control of spending; Prevent administrative abuses	1. Teaching teachers	1870 - 1885	Underdeveloped	N/A
			2. Applied Philosophy	1886 - 1905	Nonstandardized	N/A
			3. Business Management	1906 - 1935	Object-of-expense	Fiscal accountability Focus upon things purchased
2. Management	1936 - 1965	Assess work efficiency; Emphasize performance measurement	4. Technical Expertise	1936 - 1950	Function-object	Apply industrial management concepts to school finance; provide broad functional categories; unit cost analyses
			5. Administrative Science	1951 - 1967	"	" "
3. Planning	1966 -	Use budget for policy formulation; Teletic; Extent time horizon; Emphasize programmatic outcomes	6. Systems Analysis	1968	Program	Focus upon instructional programs and objectives; long-range emphasis; specify assumptions; explicit evaluative criteria

scholars still attempt to explain important events in terms of what The Leader is or does. There seems to be a growing tendency to assume that administrative procedures, instructional approaches, schools, and fiscal structures must be a analyzed as systems or system components (in the broad sense) and that these systems may be extraordinarily open./5/

Proponents of systems procedures seek to diagnose and revitalize current planning procedures while developing better articulation of future goals. One type of systems concept is PPBS, which is described next.

PPBS: CONCEPTUAL AND OPERATIONAL ELEMENTS

PPBS is part of the new generation of interrelated management procedures which seek to enhance organizational rationality. The extension of the time horizon in educational planning with the program budget is a way of attempting somewhat to control the future instead of merely reacting to it and being controlled by it. The conceptually distinct elements of planning, programming, and budgeting constitute the process by which objectives and resources, and the interrelations among them, are taken into account to achieve a coherent and comprehensive program of action for an organization as a whole./6/ An essential operational characteristic of PPBS is the projection of total resource and dollar needs for a suitable number of years and in relation to key decision variables of the organization.

Characteristics and Advantages of PPBS: Twenty Theses

The twenty theses/7/ which follow are aimed at describing, in outline form, the concept of program budgeting (PB) as it should operate in local educational planning.

1. Output Emphasis. The budget is structured on the basis of outputs, missions, functions, activities, services, or programs, rather than on conventional input items. A program is related to operational objectives, and consists of activities to be performed, sub-programs, and program elements such as human resources, materials, space and facilities.

2. Input-output coordination. PB seeks to relate inputs to the programs of an organization in a way which enhances a rational means-ends calculus.

3. Evaluation. Comparison of desired outcomes, as expressed in programmatic objectives, may be made with actual accomplishments. Performance indicators are utilized, such as indices which measure changes in pupil cognitive development.

4. Long-range fiscal planning. The annual budget is integrated with multi-year projections on a continuing basis. Typically, a program budget document portrays estimates of needs and costs over a time horizon of at least five years. Annual planning calendars and cycles are constructed.

5. Quantitative analysis. In order to analyze comparative benefits, quantitative measures are applied if they are available. These include such techniques as: input-output analysis, benefit-cost analysis, cost-effectiveness evaluation, operations analysis, management information systems, linear programming, simulation, queuing theory,

gaming and others. Qualitative measures are also included and they should play a major role in educational planning.

6. Multiplicity of options. PB provides a framework for the consideration of all relevant alternatives for a particular course of action. These are then placed in order on the basis of desirability, feasibility, least cost, available resources, and other criteria.

7. Programming. Lines of action are drawn to coordinate the planned objectives, programs and activities, and costs along an extended time dimension.

8. Program review and revision. In addition to program formulation and analysis, procedures for periodic review and modifications of programs are specified. This process is dynamic, viable, and promotes the adoption of innovations. Intra-program studies are encouraged.

9. Subprograms and Program Elements. Each of the major programs contains delineated sub-programs which minimize overlapping. Supporting program elements for each are specified.

10. Future needs. More explicit assumptions can be made about future demand and production functions of the organization. Risk is reduced and assumptions are specified. Total cost implications of long-term undertakings are expressed.

11. Economic rationality. There are at least two schools of budgetary theory, one subscribing to economic rationality and the other to political rationality. PB is essentially an economic concept designed to serve in the political arena. It represents an encroachment of economics upon politics, and is an embodiment of classical political economy.

12. Flexibility. PB does not impose arbitrary constraints. Programs can be defined in any way suitable to a particular organization. This approach is suitable both for internal programming and control and for development of future policies and programs.

13. Openendedness. Expenditure items are not treated as givens. The amount available for the total system is determined and the highest utility alternatives are selected for the specified budget programs. The major objective is not expenditure control in the fiduciary sense.

14. Policy determination. Budgeting becomes an integral part of the administrative process with PPBS. The financial administrator shares in policy formulation, and provision should be made for a continuing dialogue among the policy maker, systems analyst, budget officer, and the organization members affected by such policy.

15. Decision centers. Within some organizations using PPBS, decision centers and cost centers are developed so that administrators can have at their fingertips historical and projected information from all phases of activity. These are retrievable from a computer data bank. Simulators of the budget can be developed.

16. Cost neutrality. PB is neutral on the issue of cost reduction. A cult of efficiency, measured by less spending, per se, is not the criterion of success for PPBS.

17. Structural variability. Organizational structural variability is maintained, because the operations may be either centralized or decentralized. If the latter, participatory planning is encouraged so that policy making is shared by all members of the organization. If the former, lowest departmental level budget estimates form the building blocks for the next level where they are aggregated, reviewed, and transmitted upward to the highest level.

18. Accountability and performance measurement. PB can be used for control and internal management purposes to review personnel data, out-put data and resource data. It seeks to measure performance and affix accountability. Cost accounting procedures are generally a part of the PB format, although it may be necessary to redesign an existing accounting system so that it will provide information to meet line-item, legal accounting requirements, and also provide data on program costs.

19. Concise budget document. The actual PB document should be concise, but complete, and should be understandable even to a lay reader. Local school budgets frequently use terminology and non-programmatic categories which are too technical and unclear for their citizenry. With PPBS, the programs should be clearly stated so that the public can grasp their contents easily.

20. Preservation of the past. The program budget encompasses the best features of previous budgeting formats: the executive budget; line-item, object budgets; and performance budgeting. It need not replace conventional budgeting procedures. For the time being, line-item and program budgets probably should be maintained concurrently as a means of descriving an organization's expenditures on both an input and output basis.

Program budgeting is not a panacea. It does not abolish the vulgarity of concern over dollars, nor does it ensure that this ideal-type blueprint will be maintained successfully in actual practice. The "original sin" in the world of school finance is not budgeting, but comprises numerous intervening variables which existed long before the program budget: human errors, poor judgement, dishonesty, resistance to accountability, administrative short-sightedness, adherence to orthodoxy, manifest political factors, and the like.

EXEMPLARY PROGRAM BUDGETING INSTALLATIONS IN LOCAL SCHOOLS

The range of projects which are designed to develop PPBS encompasses the United States Government, industry, state and municipal governments, higher education, and local school systems. For these diverse organizations, the common aim is to chart the direction of future events less in response to impulse than to reasoned strategy. Although program budgeting is still in a formative stage in education, a small number of urban school districts claim to be phasing-in at least several aspects of a program budget format. Close observation of their procedures reveals that some have simply continued their conventional planning and budgeting approaches, but under the disguised name of program budgeting.

Perhaps the most common misuse of PPBS by school districts is to assume that the concept applies only to a school's fiscal operations. Most districts which claim that they are moving towards a PPBS design apparently do not involve curriculum-instructional specialists until a later phase, if they are involved at all. If this new approach is to be successful, it is imperative that instructional specialists be involved from the very inception in the design of the program structure and classification of the program components. Progress has been impeded by the newness of the concept, the lack of familiarity of most school officials with recently developed management science techniques, perennial resistance to innovation which plagues education, and insufficient venture capital to engage in research and development projects of any kind.

Representative Local School Districts

Among the urban districts which purport to be using program budgeting are: Baltimore, Chicago, Dade County (Miami, Florida), Los Angeles, Memphis, New York City, Philadelphia, Sacramento, Seattle, and an intermediate district in Westchester County, New York. Detailed information for each project is generally available upon request. In this writer's judgement, three of the most interesting and noteworthy projects are those of Dade County, New York City, and Sacramento.

1. Dade County Public Schools. In early 1968, the District announced that it received approval for a Title IV (E.S.E.A.) research proposal for the three-year, $600,000 comprehensive project in program budgeting. Although this project may have a national impact upon schools which are seeking directional assistance, it is likely to take several years until definitive guidelines and technical manuals are prepared by Dade County and made available to interested outside parties. A unique feature of this project is that it is sponsored jointly by the District and the nation-wide Association of School Business Officials (ASBO), the latter organization serving as the dissemination agent for this venture.

The District developed a comprehensive program called a "Strategy of Teaching", which pertained to the overall improvement of its instruction program. One part of this project involved the design and implementation of a management system capable of providing support to the teacher in specified ways. Teacher support was organized into three major efforts:

a. Instructional Services. This category includes research developing and pilot testing experimental, instructional programs, evaluation of results, and massive in-service training for personnel to acquaint them with the "Strategy of Teaching".

b. Administrative Services. Included are services related to personnel, procurement, finance, planning, data processing, management reports and others.

c. Operational Services. This category contains physical services needed by teachers, such as building and capital outlay programs, maintenance, operations and custodial services, transportation and others.

Each of these service areas was described in greater detail by the District. For example, one objective for Administrative Services was the development of a five-year operating plan with a program budget in which all costs of the schools would be identified in three distinct ways: by object class, by responsibility, and by program. In addition, PERT networks were prepared and a data bank designed as a means of providing school officials with reports by which they could better evaluate the qualitative and cost performance of various programs. A management training course was developed to introduce personnel of all administrative levels, from assistant principal upwards, to the new format. Efforts were directed towards the development of a series of procedural manuals in the areas of overall system design, cost systems, program identification, accounting procedures, program budgeting, evaluation, electronic data processing, and others. Included in the original program budget research proposal was Table 2, which serves as a model of conciseness in summarizing projects. The areas of research, or functions, are listed across the top of the table, and beneath each area is a summary of 1) objectives, 2) procedures, and 3) the products of research which the "Strategy for Teaching" project is intended to yield.

The Dade County project appears to be quite promising, but early results will probably not be available until at least 1970.

2. New York City Public Schools. In early 1967, the City of New York Board of Education announced first phase plans for the development of a comprehensive PPBS, promising that "... this will be the first such installation in a large city school district."[8] The entire State of New York adopted PPBS in 1964, and the municipal government of New York initiated PPBS in 1967, so that the decision of the School District was an extension of earlier efforts. Because of its fiscal dependence status, the School District's policies tend to follow those of the City Government.

Pursuing a strategy sharply different from that of other government units which are installing PPBS,[9] New York City's "... overall approach has deliberately, been opportunistic, rather than systematic and comprehensive. We have concentrated our efforts on analysis, rather than on program structure and accounts, and we have focused on sectors of high apparent yield."[10] A partial justification for this approach is that the massive effort to classify City expenditures by program category and to articulate and quantify all programs' objectives might suffocate the basic intent of rational planning.

The City suggested that a number of factors contributed to its limited capacity to engage in conceptual budgeting: 1) absence of a highly developed budget making apparatus; 2) inadequate information systems; 3) lack of personnel and inexperience in program planning; 4) centralization of budget control; 5) line-item basis for budget construction and administration; 6) predominance of established practice in key municipal programs (e.g., police, fire, education); and 7) lack of funds for innovation and experimentation.

A number of first steps were taken in 1967-68 towards the PPBS format which are suggestive of preliminary procedures needed for rational educational planning:

1. recruitment efforts to employ program analysts;
2. establishment of a Policy Planning Committee;
3. analysis of the capital and operating budgets by objective;
4. review of projects by community area within the City;
5. efforts to establish proximate goals for new projects;

6. establishment of a Division of Program Planning;
7. PPBS *probes* in key areas;
8. usage of cost-effectiveness procedures;
9. project information and scheduling systems; and
10. proposals for a *Think Tank* to analyze city problems.

In addition, the City hired Rand Corporation to a six-month study of selected agencies. Rand, which conducted most of the initial research on PPBS for the Federal Government, committed more than five per cent of its 1968 budget to the problems of the City.

The City School District, with an expense budget exceeding $1.5 billion and serving more than 1.1 million pupils with 60,000 teachers, hopes that the new budgeting system will provide better accountability and guide the Board of Education in policy decisions. One objective was to obtain a breakdown of every function of the school system into component cost factors, so that policy makers could determine whether the amount allotted to each function, or general program, was yielding its stated objective in the most efficient manner. A second objective was to facilitate long-range planning. After a complete examination of alternative ways of achieving a given objective, the District hopes to be able to spell out in detail the objectives it seeks to accomplish over a five-year period and relate these to available resources. A third objective is to decentralize budget administration, even though PPBS appears to posess a centralizing bias. The District's one and one-half billion dollar budget tends to be highly centralized for reasons of administrative efficiency.

The purpose of PPBS in the District is described thus by the official in charge of the new program:

> It is the intent of PPBS to relate costs to objectives of the New York City School System. In that way, we can more realistically determine if we get maximum value for our dollar. Output measures, or what industry would call productive units, would be examined and financial resources reallocated, if desired results are not maintained.
>
> In addition, we are trying to bring costs down to the school level so that in the process of decentralizing New York City Schools we shall know, and the communities will know, what the total costs are for each school. It will be possible, therefore, to reallocate resources even on the individual school level in an attempt to facilitate optimal achievement of the children.[11]

Initially, the District chose rather crude output measures; for example, high schools used eight output measures, and one representative school provided the following data:

1. Pupil attendance - 94.4%;
2. Extra-curricular pupil participation - 25%;
3. Number of diplomas granted
    a. Academic 280
    b. General 360
    c. Other 100
    d. Not graduating 85;
4. Number of scholarships and awards earned - 65;

5. Pupils taking 5 or more major subjects - 30%;
6. Pupils with grade average of 85% or more - 10%;
7. Number of pupils discharged
    a. With employment certificates - 45
    b. 17 years of age and over - 35;
8. Test results
    a. Metropolitan Achievement Tests (reading)
        (1) Mean grade equivalent - grade 9 = 9.6
        (2) " " " - grade 10 = 10.4;
    b. Other test measures
        (1) Pupils passing Regents Exam - 75%
        (2) Pupils passing Uniform School Exam - 70%.

It is too soon to judge the worth of program budgeting in New York.

3. Sacramento (Calif.) City Unified School District. The Public Schools of Sacramento operate within a program budget type of framework. This school district, with about 55,000 pupils and total expenditures of $37 million for 1967-68, prepares its budget in terms of three program areas: administrative services, instructional programs and services, and supporting services. The largest of the three program areas is instructional programs and services, and it is further subdivided, largely on a grade-level basis, into twelve programs: 1) instructional administration; 2) curriculum development; 3) special services; 4) special programs; 5) elementary schools; 6) junior high schools; 7) senior high schools; 8) schools for adults; 9) continuation high schools; 10) summer school programs; 11) staff training and summer demonstration schools; and 12) special projects.

> The Sacramento Schools' budget is a combination, or a hybrid, of a budget by programs and a program budget. By use of account codes in the computer, it is run in three formats: 1) by State required classifications, which is an object budget; 2) by programs, which is the working budget; and 3) in publication format for presentation to the Board of Education and to the public. Some programs, notably federal ones, include appropriations for indirect costs. Most programs include only appropriations for direct costs.[12]

As of 1968, it is probably accurate to state that there is insufficient evidence to predict the extent to which program budgeting and operations analysis procedures would be installed successfully in local school systems. Each of the projects described above was somewhat exploratory and is not yet a finished product. If they are evaluated by the same people who initiated them, they will be undoubtedly "doomed to success".

COST-EFFECTIVENESS AND PERFORMANCE CRITERIA

It would be premature to establish overall measures of effectiveness in local schools before suitable program structures have been devised. The very heart of the PPBS concept is the program structure, for it makes the outputs of a school visible and identifies the resources required to yield these outputs.

Alternative Program Structures

Where does one look for ideal-type program structures? Several program analysts have observed that "programs are not made in heaven"; rather, they are imposed on the natural world by man. There is no single best program format for schools. Inasmuch as the local schools of OECD-member nations differ in organizational structure, size, clientele, staff expertise, pupil needs, and fiscal resources, they will probably also differ in the goals they specify, the curricular programs they offer, the priorities they assign to competing program elements, and in their achievement as measured by performance indicators.

There are at least three basic approaches to devising a program structure. The first is to use organizational, or grade level, categories. Programs might include: 1) early childhood, 2) primary grades, 3) intermediate grades, 4) middle school, 5) technical high school, 6) comprehensive high school, 7) junior college, 8) adult education, etc.

A second approach, and probably the ideal type, is to devise programs on the basis of curricular (subject-matter) organization. Direct and indirect costs are apportioned to subject areas, such as: 1) language arts, 2) science, 3) mathematics, 4) 4) social science, 5) creative arts, 6) special education, etc. The third option is a hybrid format which combines grade level organization at the elementary level with subject-matter organization at the secondary level. Generally this reflects existing state certification procedures whereby instructors are certified as elementary teachers through grade six and as mathematics, language, or social studies teachers at the secondary level. The latter two approaches are the most desirable, yet most difficult type to develop, and so it is the first approach which is most widely used among the ten local school districts mentioned earlier. Cost-effectiveness analysts might heed the advice of one school finance official:

> If program activity and subactivity statements and performance statistics were required, this alone would be a herculean task. For a superintendent to evaluate the effectiveness of each account appears to be impossible. Surely, for those who wish to embark on the path towards program accounting only an absolute minimum of programs and activities should be costed out. And what is equally important they should be costed out on an accrual rather than a cash basis.
>
> What the structure of program costs should be, no one really knows. Some persons think that school districts, particularly the large systems, should seek to attain the ideal -- in other words, program costs for subject matter by grade level, with costs assigned to each school in the system. The literature abounds with such proposals particularly by college professors. Before anyone takes his school system down this primrose path, he should weigh seriously the benefits to be derived against the costs involved. Program costs by subject matter by grade level by school involve a vast amount of work because it necessitates the gathering and manipulation of numerous cost items./13/

Criteria of Effectiveness

Nearly all attempts to apply benefit-cost and cost-effectiveness analysis to education have been made on a national or regional basis, or have been devoted to specific programs such as vocational education or compensatory programs (Title I, in particular). Becker, Blaug,[14] and others calculated private and social rates of return to secondary and higher education which indicate that education has a positive effect upon lifetime earnings, reduced unemployment, reduced juvenile delinquency, and intergeneration benefits. Bowman reviewed the main analyses of human capital formulation, a development which she calls "the human investment revolution in economic thought".[15] The United States Office of Education has conducted symposia on operations analysis which focus upon operations analysis procedures, including benefit-cost analysis.[16] Kiesling and Ribich[17] attempted to quantify educational benefits from compensatory elementary and secondary programs. Using a sample of children in the Higher Horizons program, benefit-cost ratios were calculated as 0.59 for elementary programs and 0.88 for junior high school programs. Another calculation was made by Ribich in one school district which showed gains from a compensatory program. Here it was found that the experimental groups gained 7 per cent a year more than a control group in grades 3, 4, and 5. This was calculated to have an average financial benefit of $168, discounted back to the fifth grade. Program cost per child was $114 for the three years, yielding a benefit-cost ratio of about 1.5.

Also at the local level, a few attempts have been made to model the educational process. Nonlinear models have been devised which relate aggregate school district operations to average achievement (as defined by specific test processes); these permit exploration for optimizing operating conditions, but they are rather crudely designed at the present time. The major weakness appears to be the lack of performance indicators, and this concept is discussed in the next section.

Performance Indicators

Cost-effectiveness analysis can be conducted after a program structure has been devised and criteria to assess performance have been specified. Even in broadly defined cost-effectiveness analysis, as described by Quade and Schwarz,[18] the need exists for means of measuring the performance of educational systems in a way that is easily interpretable by educators and policy makers and at the same time avoids as far as possible assumptions that cannot be empirically supported. Standardized tests of academic achievement have long been used as indicators of system performance, although they may have created more problems than they resolved. A common approach has been to try to predict from a pupil's I.Q. scores what his achievement should be and then to compare his actual achievement test scores with the predicted scores. Critics have noted a number of fallacies in this procedure.

Several attempts to devise better performance indicators in education include the Quality Measurement Project (QMP) of New York State and recent projects undertaken by the Educational Testing Service (ETS) of Princeton, New Jersey. QMP was an attempt by the New York State Education Department to develop a series of differentiated achievement test norms which would provide data by which a local school administrator could compare the performance of his district's students with that of students in other systems of similar economic condition and I.Q.[19]

Dyer, an ETS measurement specialist, noted that, "A further step along the road toward believable educational performance indicators was taken by Educational Testing Service in the development of a plan for measuring the quality of education provided by the school systems in Pennsylvania."/20/ This was a refinement and more comprehensive version of New York's QMP; it was mandated by the Pennsylvania legislature. The State Board of Education was given the charge to develop in two years' time "... an evaluation procedure designed to measure objectively the adequacy and efficiency of the education programs offered by the Commonwealth." If successful, this evaluation procedure eventually could provide two kinds of results: 1) it could enable each district to appraise the effectiveness of the programs shown in a program budget in sufficient detail to indicate what should be done to strengthen them; and 2) it could provide state education departments with program performance standards to aid in allocative decisions to all districts across a state. Dyer explained that in order to depict how a system is performing, ETS constructed a matrix of performance indices (time dimensions which indicated years of schooling; changes in cognitive development, attitudinal development, interpersonal behavior, etc.). Regression equations were developed and matrices constructed for each district to show the general areas where it may be strong or weak, and to suggest where increased effott and money might have the highest pay-off. Thus, performance indicators developed by ETS provide a series of estimates of how well a school district is going in comparison with other districts working under presumably comparable advantages and handicaps./21/

A highly publicized study which used student performance measures to test hypotheses about the relationships between educational ends and means is Coleman's Equality of Educational Opportunity. Numerous implications for making decisions about program resource allocations are contained in the study, but a number of criticisms have arisen. For example, Levin, of the Brookings Institution, argued that the Coleman analysis was: 1) "... overwhelmingly weighted in a direction that would understate the importance of school resources in explaining variations in achievement," and 2) "... biased by a research design which overstated the importance of family background and derogated the influence of school resources on student achievement /22/ Nevertheless, such studies may lead to improved utilization of cost-effectiveness procedures in local schools.

CONCLUSION

Perhaps the report of PPBS in local educational planning would be told better by emphasizing potential usage rather than past achievement. In no school district is PPBS fully implemented. Converting function-object line budgets into a multi-year framework focused on operational objectives inevitably encounters bottlenecks. Few competent cost-effectiveness analyses have been completed, and even fewer are integrated into the program budgeting process. In addition to shortages of data and measurement criteria, there are conceptual questions for analysts to answer: 1) If costs are incurred at one point in time, and benefits are received in another, should benefits occurring far out in time be valued less than those with immediate pay-off? 2) What discount rates should be used? 3) Are the benefits to be specified as individual or social?

After its installation in a local school, program budgeting may initially serve to accentuate conflicts and engender antagonisms as organizational objectives and priorities are exposed in the cold, bold figures of the dollar. It can be anticipated that with the introduction of PPBS, bureaucratic inertia, vested interests, old prides, honest differences of opinion, and political factors will not suddenly disappear. A dozen exemplary limitations of the program budget format are listed below:

1. Organizational strains are not eliminated;
2. Political elements may act as a barrier to PPBS;
3. Degree of centralization of authority is not clear;
4. Every systems analysis has defects;
5. Projecting long-range program costs is hazardous;
6. Opposition to planned change permeates education;
7. Evaluation of educational programs is primitive;
8. Local schools have inadequate staffs for systems planning;
9. Activities and programs may not be mutually exclusive;
10. Present educational goals are stated as cliches and truisms;
11. United States Office of Education program structure is not appropriate for local schools; and
12. Conclusive evidence of the success of PPBS in education is not abundant.

The focus upon existing shortcomings of program budgeting is not intended to provide a self-defeating detraction from its application to education. Rather, it would seem to call for wider usage of this concept in order to debug present designs. It is apparent in systems analysis that the best way to control the quality of output is to control the quality of input. However, public schools have no such intake value; they must serve all. "Underlying the general advancement in educational planning techniques are several major causes: a) demands for greater efficiency are being placed upon school officials; b) improvements are taking place in the methods of framing the problems and organizing available data; and c) more detailed analyses of the data are possible because of more precise economic tools."/23/

Program budgeting merely sets the proper stage for systemic planning, but does not guarantee that the play will be a success.

FOOTNOTES

1. A detailed review of recent research literature and a discussion of the operational aspects of PPBS is contained in Harry J. Hartley, Educational Planning-Programming-Budgeting: A Systems Approach (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., to be published in August, 1968).

2. Allen Schick, "The Road to PPB: The Stages of Budget Reform," Public Administration Review, XXVI, No. 4 (December, 1966), 243-258.

3. Stephan J. Knezovich and John Guy Fowlkes, Business Management of Local School Systems (New York: Harper and Brothers, 1960), p. 19.

4. McGeorge Bundy, Chairman of Mayor's Advisory Panel on Decentralization of the New York City Schools, Reconstruction for Learning (New York: Office of the Mayor, November, 1967), p. 53.

5. Donal A. Erickson, "Foreword," Review of Educational Research, XXXVII, No. 4 (October, 1967), 376.

6. Arthur Smithies, "Conceptual Framework for the Program Budget," Program Budgeting: Program Analyses and the Federal Government, ed. David Novick (Cambridge, Massachusetts: Harvard University Press, 1965), Chap. ii.

7. Taken from Hartley, op. cit., Chap. iv.

8. Bernard E. Donovan, Superintendent of Schools, Staff Bulletin, The Public Schools of New York City, V, No. 5 (December 12, 1966), 1. A general description of the approach to be taken was provided in PPB: An Introduction, prepared by the Board of Education's PPBS Staff and the Stanford Research Institue, OPPB Bulletin No. 1 (June, 1967), 14 pp.

9. Fifteen governmental units are developing PPBS procedures as part of the State and Local Finances Project, which is supported by a grant from the Ford Foundation to the George Washington University. It consists of five states, five counties, and five cities.

10. Frederick O'R. Hayes, Director of the Budget, City of New York, PPBS in New York, September 19, 1967, p. 1 (Mimeographed).

11. Letter from Murray Hart, Assistant Superintendent for the Office of PPB, Board of Education of the City of New York, January 10, 1968.

12. Letter from Henry J. Moeller, Director of Budget Services, Sacramento City Unified School District, November 13, 1967.

13. Orlando F. Furno, Director of Research, Baltimore City Public Schools, "Program Budgeting and School Quality," Association of Educational Data Systems Monitor, V, No. 9 (April, 1967), 13.

14. Gary S. Becker, Human Capital (Princeton, New Jersey: Princeton University Press, 1964), 187 pp.; Mark Blaug, "The Rate of Return on Investment in Education in Great Britain," Manchester School of Economic and Social Studies, XXXIII (September, 1965), 205-26.

15. Mary Jean Bowman, "The Human Investment Revolution in Economic Thought," Sociology of Education, XXXIX (Spring, 1966), 111-37.

16. A recent example was the symposium on "Operations Analysis of Education," Division of Operations Analysis, National Center for Educational Statistics, Office of Education, U.S. Department of Health, Education, and Welfare, The Washington Hilton, Washington, D.C., November 19-22, 1967. Proceedings were published in 1968.

17. Herbert J. Kiesling, Some Program Analysis of Title I of ESEA, paper prepared by a former member of the staff of the Assistant Secretary for Program Coordination, Department of Health, Education, and Welfare (Bloomington, Ind.: Department of Economics, Indiana University, 1967), 80 pp. (Mimeographed); additional economic analysis of compensatory programs is provided by Thomas Ribich in his forthcoming book which is to be published by the Brookings Institution.

18. E.S. Quade, Cost-Effectiveness: An Introduction and Overview, P-3134 (Santa Monica: RAND Corporation, May, 1965); Quade, Some Comments on Cost-Effectiveness, P-3091 (Santa Monica: RAND Corporation, March, 1965); Brita Schwarz, Program Budgeting and Cost-Effectiveness Analysis in Educational Planning (Paris: O.E.C.D., October, 1967), pp. 9-12. (Mimeographed).

19. W.D. Firman, "The Quality Measurement Project," Science Education, L, (April, 1966), 259-79.

20. Henry S. Dyer, "The Pennsylvania Plan", Science Education, op. cit., pp. 242-51.

21. Henry S. Dyer, The Concept and Utility of Educational Performance Indicators, Paper presented to the 1967 Systems Science and Cybernetics Conference, Boston, Massachusetts, October 12, 1967, 17 pp. (Mimeographed).

22. Henry M. Levin, "The Coleman Report: What Difference Do Schools Make," Saturday Review, January 20, 1968, pp. 57 and 66.

23. Harry J. Hartley, "Economic Rationality in Urban School Planning: The Program Budget, Urban Education, III, No. 1 (1967), 40.

PROGRAMMATION BUDGÉTAIRE ET COUT-EFFICACITÉ DANS LES INSTITUTIONS RÉGIONALES

par Harry J. Hartley (Résumé)

Cette étude poursuit cinq objectifs :

(1) Examiner les phases d'une réforme budgétaire afin d'expliquer en quoi la budgétisation programmée peut remplacer la méthode dite "additive" qui domine actuellement la planification de l'école à l'échelon local ;

(2) Décrire quelques-uns des éléments conceptuels et opérationnels du PPBS ;

(3) Décrire plusieurs exemples de mise en route de la budgétisation programmée dans diverses écoles ;

(4) Examiner quelques-uns des indicateurs de rendement qui finalement pourraient être utilisés dans l'analyse coût-efficacité ;

(5) Souligner les limites actuelles de la technique des systèmes pour les écoles à l'échelon local.

Réformes budgétaires et méthode additive

Les stratégies nouvelles en matière de procédures et d'affectation des ressources, fondées sur l'analyse des systèmes pour la planification d'une organisation, deviennent couramment utilisées pour la planification des programmes d'études et la planification financière des écoles. L'avantage essentiel de la budgétisation programmée par rapport aux méthodes traditionnelles est que cette nouvelle technique attache une plus grande attention aux outputs (quelle que soit la façon dont on les définit), ou aux finalités programmées de l'école plutôt qu'aux inputs (ce qui est acheté) qui sont nécessaires à la mise en oeuvre de ces programmes.

Dans tout pays dont le système éducatif est décentralisé, il est vraisemblable que tous les districts scolaires à l'échelon local auront mis au point toute une variété de contraintes, de procédures et de pratiques budgétaires. Le budget de l'école à l'échelon local aux Etats-Unis a évolué progressivement ; ses stades successifs de développement ont été :

(1) le budget objet

(2) le budget fonction-objet

(3) le budget programmé

Le budget du type "objet de dépense" consiste en une liste d'éléments tels que les salaires, les fournitures, les équipements, les services, etc. qui ne tient pas compte de la fonction de chacun de ces éléments. Le budget "fonction-objet" qui apparût avant 1920 regroupe les coûts suivant plusieurs larges catégories de fonctions et d'objets et décrit ces catégories d'après les subdivisions qui les composent, fonction et objet, en les traitant comme des dépenses primaires.

Le budget "fonction-objet" répond aux besoins des responsables de la direction ; voici quelques larges rubriques qu'il peut inclure :

(1) Administration
(2) Enseignement
(3) Fonctionnement de l'établissement
(4) Entretien de l'établissement
(5) Organismes auxiliaires
(6) Charges fixes
(7) Dépenses en capital
(8) Service de la dette

Les rubriques 1 à 5 sont des activités fonction ; tandis que les rubriques 6, 7 et 8 sont des objets de la dépense qui concernent toutes les fonctions. Le budget fonction-objet est le type de budget utilisé presque exclusivement par les écoles publiques à l'échelon local ; il a favorisé ce que l'on appelle la méthode de l'augmentation continue pour la planification de l'enseignement. La base primordiale du budget de l'année prochaine est le budget de l'année en cours et la différence principale entre les deux budgets n'est vraisemblablement qu'une augmentation pour chacune des rubriques traditionnelles du budget, qui comporte une rubrique par ligne.

La méthode additive dans la planification de l'enseignement semble être progressivement remplacée par une nouvelle méthode qui comprend un ensemble de techniques que l'on classera dans la rubrique de l'analyse des systèmes. Les défenseurs des procédures de systèmes s'efforcent d'établir des diagnostics et de revitaliser les procédures actuelles de planification tout en recherchant une meilleure cohérence des objectifs poursuivis. L'un des concepts à base de système est le PPBS (Système de Planification, de Programmation et de Budgétisation).

L'étude énumère et souligne le contenu d'un certain nombre des caractéristiques du PPBS, à savoir :

(1) Prééminence de l'output
(2) Coordination input-output
(3) Evaluation
(4) Planification financière à long terme
(5) Analyse quantitative
(6) Multiplicité des variantes
(7) Programmes primaires et éléments de programmation
(8) Finalité économique
(9) Flexibilité
(10) Possibilités d'évaluation comptable et évaluation du rendement
(11) Concision des documents budgétaires

Exemples de mise en route d'une budgétisation programmée dans les écoles à l'échelon local

Bien que la budgétisation programmée n'en soit encore qu'à ses débuts dans le domaine de l'enseignement, quelques districts d'écoles urbaines sont en train d'incorporer à leurs budgets plusieurs aspects d'une budgétisation programmée. Les dispositions prises par le Comté de Dade, les villes de New-York et de Sacramento (Californie) sont décrites.

Au début de 1967, les services de l'enseignement de la ville de New-York ont annoncé la phase préliminaire de plans pour la mise en oeuvre d'un PPBS global. Quelques décisions préliminaires ont été prises qui montrent le type de procédures nécessaires à une planification rationnelle de l'enseignement :

(1) Efforts pour recruter des analystes de la programmation
(2) Création d'un comité de politiques de planification
(3) Analyse du budget (dépenses en capital et dépenses opérationnelles) par objectif
(4) Examen des projets par zones dans la ville de New-York
(5) Tentatives d'établir des objectifs approximatifs pour les nouveaux projets
(6) Création d'une division de la planification programmée
(7) Enquête sur le fonctionnement du PPBS dans des zones-clef
(8) Utilisation de procédures coûts/efficacité
(9) Systèmes de données concernant les projets et systèmes d'emplois du temps
(10) Propositions pour la création d'un "Groupe de conception" chargé d'analyser les problèmes de la ville de New-York.

Coût-efficacité et critères de rendement

Au centre du concept du PPBS se trouve la structure du programme, car elle met en relief les outputs d'une école et indique les ressources nécessaires pour les obtenir. Il n'y a pas un type particulier de programme qui soit meilleur que les autres pour les écoles. Dans la mesure où les écoles à l'échelon local des pays Membres de l'OCDE diffèrent de par la structure de leur organisation, leur dimension, leur clientèle, les connaissances de leurs enseignants, les besoins de leurs élèves et les ressources dont elles disposent, elles n'auront probablement que très peu de points communs également pour ce qui est des objectifs qu'elles se sont fixés, des programmes d'études qu'elles offrent, des priorités qu'elles accordent aux éléments du programme en concurrence, et de leurs taux de rendement tels qu'ils sont évalués par les indicateurs appropriés.

Il y a au moins trois méthodes fondamentales pour mettre au point une structure programmée. La première est d'utiliser des catégories correspondant à l'organisation ou au niveau des classes. Une deuxième méthode, probablement la méthode idéale, est de mettre au point les programmes sur la base de l'organisation des programmes d'études (sujet-matière). La troisième possibilité est un système hybride qui combinerait une organisation par niveau de classe au niveau de l'école élémentaire, et une organisation de type sujet-matière au niveau secondaire.

Pratiquement, toutes les possibilités d'appliquer les analyses coût-bénéfice et coût-efficacité à l'enseignement ont été étudiées sur une base régionale ou ont été consacrées à des programmes spécifiques tels que l'enseignement professionnel ou à des programmes de compensation. A l'échelon local, cependant, quelques essais de mettre le processus d'enseignement sous forme de modèle ont été entrepris. La principale faiblesse semble être le manque d'indicateurs de rendement. Parmi les diverses tentatives de mise au point de meilleurs indicateurs de rendement pour l'enseignement, on citera : le Projet d'évaluation qualitative (QMP) de l'Etat de New-York, et divers projets entrepris récemment par le Service des examens de l'enseignement (ETS) à Princeton, New-Jersey. Le QMP comprend une série de normes différenciées s'appliquant aux tests de vérification des connaissances qui fourniraient des données permettant à l'administrateur d'une école à l'échelon local de comparer les réalisations des élèves de son district avec celles des élèves d'autres systèmes qui se trouvent dans des conditions économiques et de quotient d'intelligence similaires. Une étude "Egalité des chances devant l'enseignement" de Coleman qui s'est servi des modes d'évaluation des réalisations des élèves pour vérifier certaines hypothèses concernant les rapports entre les objectifs éducatifs et les moyens, a connu un vif succès.

Conclusion

Peut-être le rapport sur le PPBS dans la planification de l'enseignement des écoles à l'échelon local devrait-il souligner davantage les utilisations potentielles plutôt que ce qui a été accompli. Le PPBS n'est encore pleinement utilisé dans aucun district scolaire. La conversion d'un budget formulé sour forme de rubriques fonction-objet en cadre pluri-annuel ayant des objectifs opérationnels rencontre inévitablement des goulots d'étranglement. Les analyses coût-efficacité qui soient satisfaisantes sont rares. Outre le manque de données et de critères d'évaluation, plusieurs problèmes d'ordre conceptuel restent à résoudre.

Souligner les difficultés existantes de la budgétisation programmée ne devrait pas en soi nuire à ses applications dans le domaine de l'enseignement. Au contraire, le faire devrait susciter une utilisation plus grande du concept afin de remédier aux différents défauts des schémas actuels. La budgétisation programmée établit un cadre adéquat pour une planification systématique, mais ne garantit pas que la tentative sera couronnée de succès.

PROBLEMS IN THE DRAWING UP OF A THREE-YEAR EDUCATION BUDGET

by Lauge Dahlgaard

While the objective of the annual fiscal budget is to authorize appropriations for the coming one-year period, long-term planning aims at providing the basis for a policy with regard to educational structure, educational capacity and the adaption of education to social needs. In this connection, one has to consider the resource requirements including the financial means required for educational development in accordance with a long-term objective.

In long-term planning, we have a number of factors which are variables, though they do not alter in the very short term. This is so in the case of educational legislation and also of the size, location and specific character of educational institutions.

It would not be right to describe three-year budgets as something in between the annual fiscal budget and long-term planning. They serve in fact as a basis for the political authorities to evaluate the balance between public expenditure and revenue for the next few years. Indeed, alterations in taxation and financial possibilities for the carrying out of new expensive arrangements should rationally be assessed on the basis of a budget covering at least the next few years. As the three-year budgets are drawn up every year - a rolling budget, so to speak - the drawing up of a three-year budget in one year is in fact a preparation for the drawing up of fiscal budgets for the next years.

For all economic sectors of society, including education, the three-year budgets help to reveal autonomous tendencies in development and to illustrate the financial possibilities and effects of measures with regard to the educational policy already decided upon or under consideration.

The following deals only with State current expenditure on education. Capital expenditure, i.e., investment in educational buildings etc., will not be dealt with here.

In most countries, State current expenditure is divided between the current costs of State institutions, and subsidies to municipal bodies and private institutions operating schools and other educational facilities. We shall not deal here separately with the current expenditure on education by municipal authorities and private institutions; but it should be remembered that the amount of State subsidies to municipal and private schools depends not only on the total amount spent by municipal and private bodies, but also on the rules governing the calculation of these subsidies. Possible changes in legislation are thus among the factors that must be taken into account when three-year budgets are being drawn up.

While the yearly fiscal budgets are largely prepared on a factual basis, i.e., the statements and evaluations of the central authorities according to the appropriation demands of the spending administrative authorities and institutions, the three-year budgets should build upon a statement and an evaluation of the general factors which, within any single field of education, determine the development of expenditure. On this basis, the three-year budgets will largely rely on forecasts concerning the factors that affect expenditure. Fairly complicated statistical and general accounts analyses of educational activities are necessary for this purpose.

There are, however, a number of areas for which a more exact evaluation of expenditure is necessary in the context of a three-year budget. In the Danish educational budget, such areas are, for instance, the administrative expenditure of the central authorities, and the expenses in connection with international co-operation in education and research.

The Danish educational budget provides for a number of institutions involved in research work for which budgeting on the basis of forecasts is simply irrelevant.

As far as universities and institutions of higher education are concerned, such budgeting on the basis of forecasts is not impossible, in principle, but in a small country such as Denmark it is very difficult. This is largely because individual institutions in the higher education sector are relatively so important that decisions taken by one of them or in regard to one of them are of very considerable importance for the whole field of higher education.

In this connection, it may be mentioned that Denmark has three universities - of which one has three-quarters of the total number of university students - one technical university, one college of pharmacy, two colleges of dentistry, and one college of veterinary science. Where any individual institution plays a big role, budgeting on the basis of forecasts may not be altogether appropriate.

Another point is that forecasting the interrelationship between various factors affecting expenditure is more difficult in the case of higher education than at lower levels.

On the other hand, budgeting on the basis of forecasts should be well suited to educational areas such as public schools, higher secondary schools, youth and adult education, technical and vocational education and teacher training, where a great number of more or less uniform institutions are spread all over the country.

Expenditure within each of these institutions and areas of education is dependent in the first place on enrolments. It is thus essential to be in possession of statistical material on the basis of which reliable short-time forecasts of the number of pupils and students within the different schools and educational fields and levels may be worked out.

The supply of teachers, premises, teaching materials etc. is dependent on the organization within the different educational sectors. In this connection, it is of particular importance to be able to record and forecast the grouping of pupils and students in forms, classes and fields of study, as this is the predominating factor in the determination of the pupil-teacher ratio.

It is evident that the duration of education and the number of lessons given per year are important in this connection. At present, an extension of the duration of courses within certain fields of education with a vocational bias is taking place. In primary and secondary schools, the introduction of a five-day week is under consideration. Here the total number of weekly lessons and of weeks of instruction per year are factors of considerable importance when the entire educational activity is to be considered.

Educational programmes and curricula within a number of educational fields are being reconsidered with a view to modernizing them. One of the objectives of the three-year budgets is the examination of the financial consequences of altered curricula and educational programmes.

Forecasts of enrolments in the various branches and at the different levels of education, together with information on the organization of education (division in forms and classes etc. of a certain size) and with curricula and study plans for the different educational fields, make it possible to estimate the development of education as a whole.

When these estimates are expressed in terms of expenditure, some additional factors enter into the picture.

These are concerned, firstly, with the regulations governing the teaching duties of teachers and the scales of salaries, within the different branches and levels of education. Salaries are a dominating factor in the total current expenditure on education. Alterations in the number of lessons a teacher in a certain category is required to give, as well as alterations in salary scales and salary pattern must be taken into consideration when three-year budgets are made up.

Information concerning other current expenses, e.g., teaching material, cleaning, repair, heating, administration etc., are at present rarely specified in such a way as to make possible an estimate of these expenses and their relationship to educational activities. During the two years that three-year budgets have been drawn up in Denmark, it has been generally assumed that the increase in "other expenses" and teachers' salaries has been proportionately the same. For a short period, such as three years, such an assumption is not unjustifiable, but there clearly is a need for an analysis of current expenditures covering a representative proportion of schools and educational institutions so that the order of magnitude and, particularly, the tendencies in the development of the different expenditures may be clarified.

As previously mentioned legislation in force for the division between the State, the municipalities, private educational institutions and trade organizations of the total educational appropriations is important for estimating the share of the State in the total expenditure on education in a future three-year period. In drawing up a three-year budget, it will normally be assumed that the existing legislation will continue to be in force. The consequences of possible amendments are usually set out in a special statement.

As already mentioned, in drawing up the Danish three-year budgets, forecasts of expenditures for teachers' salaries within each educational field have so far served as a base for the estimate of the increase in total current expenditure.

The validity of such an approach must be judged on the basis of the proportion which salary expenditure represents in the total current costs of the Ministry of Education. Salary expenditure - including State subsidies to municipal and private educational institutions' salaries - amount to 79% of total current expenditure of this Ministry. A further 5% of the budgetary expenditure consists of financial aid to pupils and students, and only 16% of the budget represents non-salary expenses.

For most of the educational institutions, salary expenses amount to nearly 70% of the total current costs.

In Denmark, however, legislation is framed in such a way that subsidies to municipal and private educational institutions are calculated mainly on the basis of the cost of teachers' salaries. Consequently, the proportion of State expenditure on salary subsidies for municipal and private educational institutions, is particularly high.

This is reflected in the following table, which shows the proportion of salaries in total State current expenditure in the different educational sectors. In this connection, it should be pointed out that, in primary and lower secondary education in Denmark, municipal schools are predominant, and that they receive a subsidy in the form of reimbursement of 85% of the municipal expenditure on teachers' salaries. In higher secondary education, well over half of the pupils are in State schools (Gymnasium), and the remainder in municipal and private schools, which receive a subsidy also essentially based on the cost of teachers' salaries. Institutions of higher education are all State-owned.

WAGES AND SALARIES IN PER CENT OF CURRENT EXPENDITURE OF THE MINISTRY OF EDUCATION

	pct.
Central administration, including financial aid to students	95
Primary and lower secondary education	98
Teacher training (primary and lower secondary)	75
Youth and adult education	73
Higher secondary education	86
Higher education (3rd level)	71
Vocational education	66
Miscellaneous	47
TOTAL	84

To illustrate the procedure in drawing up budgets and the problems thus encountered, let us examine the basic material from which State expenditure on the municipal primary and lower secondary schools has been estimated for the three-year period 1968-69 to 1970-71.

NUMBER OF PUPILS AND TEACHERS IN PRIMARY AND LOWER SECONDARY SCHOOLS AND SUBSIDIES TO THESE SCHOOLS

		1967-68	1968-69	1969-70	1970-71
1.	Number of pupils in 1st-10th forms in municipal and private primary and lower secondary schools (in 1000)	676	680	685	695
2.	Number of pupils in 1st-10th forms in municipal primary and lower secondary schools (in 1000)	611	614	619	627
3.	Number of classes in municipal primary and lower secondary schools	28,000	28,700	29 200	29,900
4.	Weekly number of teachers' wage hours in these municipal schools (in 1000)	1,190	1,220	1,250	1,290
5.	Index for 4	100	103	105	109
6.	Number of teachers in these municipal schools	30,000	32,000	34,000	36,000
7.	Index for 6	100	100	113	120
8.	State subsidy to these schools (in million DKr.)	1,278	1,318	1,352	1,392

The following information should be added to the above table.

The number of pupils and their grouping by forms has been estimated on the basis of statistical data comprising detailed information on each pupil. Transition rates from one form to another have been recorded in the last few years, and on the basis of these rates and their future trend, the number of pupils could be estimated, not only at the compulsory but also at the voluntary form-levels.

The difference between the number of pupils recorded in items 1 and 2 of the table is the number of pupils attending private schools.

The number of pupils mentioned in item 3 of the table assumes an unaltered pupil/class ratio (average number of pupils per class in each of the forms).

The weekly number of teachers' wage hours in municipal schools (primary and lower secondary) is calculated on the basis of known figures for the weekly number of wage hours per class in each form. An average increase of 2% yearly in teaching time (wage hours) per class has been estimated.

Information under item 6 in the table has been taken from the section on teacher training in the three-year budget, which provide an analysis of future additions and withdrawals from the stock of qualified teachers.

The basis assumed for the estimate of State subsidy to primary and lower secondary schools is actually fairly conservative. During the last few years, there has been a somewhat higher increase in teaching time required per class than that mentioned above, and there has also been a certain decrease in the pupil/class ratio. When comparing the index in item 5 of the table for the increase in total weekly teaching time (wage hours) with the rate of increase in the number of teachers in item 7, it becomes clear that the present teacher shortage in the primary and lower secondary school will diminish considerably in the next few years.

This, however, raises a number of problems. In Denmark, primary and lower secondary teachers are under obligation to teach 32 lessons (wage hours) weekly. Teaching in excess of this is remunerated as overtime at a rate of 20% higher than that for normal hours. Maintenance of the need for overtime lessons may therefore be of great financial interest to individual teachers.

The following table shows primary and lower secondary teachers divided according to their weekly number of lessons expressed in wage hours.

Weekly number of wage hours	Men pct.	Women pct.	Total pct.
1 - 14	0.1	0.1	0.1
15 - 19	0.2	2.1	1.2
20 - 24	0.4	6.8	3.7
25 - 29	0.3	9.3	5.0
30 - 31	0.2	2.5	1.4
32	5.1	14.7	10.1
33 - 34	9.4	20.6	15.2
35 - 36	17.5	19.3	18.4
37 - 38	18.1	10.5	14.2
39 - 40	16.6	5.2	10.7
41 - 42	13.1	2.8	7.8
43 - 44	8.8	0.9	3.7
45 - 48	7.4	0.4	3.8
49 - 50	2.8	4.8	3.7
TOTAL	100.0	100.0	100.0

The average number of weekly overtime lessons (wage hours) is 4.6, and the table shows that there are wide deviations from this average. 32% of the male teachers had at least 9 weekly overtime hours, while 35% of the women teachers had no more than the obligatory number of lessons.

Trends in demand for and supply of teaching time (wage hours), as shown in the three-year budget, thus seems to lead to one of the following conclusions:

a. reduced earning possibilities for a considerable number of teachers;

b. need for the State and the municipal authorities to compensate teachers for loss of present earnings, which would be very costly and hardly practicable;

c. unemployment among qualified teachers if those presently employed are allowed to keep their present number of overtime lessons;

d. increase in total requirements for teaching time in primary and lower secondary schools, through a decrease in the pupil/class ratio and/or an increase in the number of teachers' wage hours per class;

e. reduction in the admittance of students to teacher training colleges, whose capacity will thus not be fully utilized.

In evaluating which of these alternatives are most likely to materialize, it should be remembered that there is a relation between supply of and demand for teaching hours. The prospects for educational development arising from decrease in teacher shortage, together with the possible desire of a slower liquidation of overtime lessons than is otherwise practicable, may cause the municipal authorities considerably to decrease the pupil/class ratio and strongly to expand educational activity, since, according to the present regulations, the State subsidizes 85% of the cost of increase in total teaching time (wage hours). The municipal authorities have consequently rather little interest in keeping the demand of the schools for more teachers and more lessons under control. The result might be a considerable increase in State expenditure for subsidizing the primary and lower secondary schools.

Because of these problems, which have been more obvious through the three-year budgets, a special analysis has been worked out bearing on the demand for and supply of teachers' lessons and the financial consequences under different assumptions with regard to the management pattern within the primary and lower secondary schools. One of the results of this analysis will probably be a revision of the rules governing State subsidies to these municipal schools. One of the objectives should be to reduce the percentage (85%) of the subsidy paid for teachers' salaries so as to make the municipal authorities more interested in economizing in their demand for teachers; and to introduce subsidies for other cost elements involved in running these schools, including those that, from a pedagogical point of view, have been administered too economically in many municipal districts.

These problems would no doubt have been taken up in any case sooner or later. The analysis attached to the three-year budget has, however, caused them to be treated earlier and in a more comprehensive way than would otherwise have been possible.

In working out the Danish three-year budget, expenditure for measures not yet decided upon is not included. Financial possibilities for carrying through new expensive legislation are, however, evaluated on the basis of the survey of the "autonomous" development of State expenditure which has been obtained through the three-year budget.

On the other hand, the three-year budget covers increases in expenditure necessitated by previous legislation that has not yet been totally implemented. As an example, the law passed in 1966 with a view to raising the standard of teacher training resulted in increased expenditure for the State, but it will not be fully effective until 1970-71, and in the meantime the expenditure on teacher training will increase, whether the number of students at teacher-training colleges increases or not.

A similar situation exists in the higher secondary school system, where a particularly heavy increase in expenditure arose due to the introduction of a new field of study at secondary level in 1967, with a number of courses leading to a new qualification, the higher preparatory examination. This new field of secondary education is expected to attract new groups of pupils to higher secondary education.

The rate of increase of total current expenditure of the State for education is estimated at 7% yearly in the three-year period. There are, however, great differences between the sectors, as shown in the following table.

ANNUAL RATE OF INCREASE IN STATE CURRENT EXPENDITURE

FOR EDUCATION 1968/69 - 1970/71

		Annual rate of increase pct.
1.	Administrative expenditure	3
2.	Primary and lower secondary education	3
3.	Teacher training (primary and lower secondary school teachers)	7
4.	Youth and adult education	3
5.	Higher secondary education	13
6.	Higher education	12
7.	Vocational and commercial education	8
TOTAL		7

The rates of increase mentioned are minimum figures. A constant monetary value is allowed for, and if a salary rise should take place during the period, a further increase in expenditure would naturally ensue. Further, no account has been taken of possible legislative measures requiring increased expenditure. Such legislation is being prepared within several fields.

However, due to the fact that the Danish budget is rather strained, and that the increase in GNP will amount to only 3% yearly in constant monetary value, the possibilities for legislation requiring increased expenditure will be limited in the coming years.

It is thus all the more important to establish carefully planned priorities for new expenditure and to economize on present items of expenditure, e.g., through amendments to the legislation governing State subsidies that will induce local authorities and institutions to economize still further than is the case at present. It is the objective of the three-year budgets to provide a basis for the evaluation of such priorities and economies.

PROBLÈMES LIÉS A L'ÉTABLISSEMENT D'UN BUDGET TRIENNAL

par Lauge Dahlgaard (Résumé)

Expériences danoises

L'objectif du budget annuel de l'Etat est de fixer la répartition des dépenses pendant l'année à venir.

La planification à long terme se concentre sur l'évaluation des politiques en matière de structure du système éducatif, de la capacité de ce système et des adaptations de l'enseignement à la société. Quelques-uns de ces facteurs constituent des variables de la planification à long terme, alors qu'ils sont immuable dans le court terme. C'est le cas de la législation en matière d'enseignement, et également de facteurs tels que la dimension, l'emplacement et les caractéristiques propres des établissements d'enseignement en cause.

Ce serait trop simplifier que de dire qu'un budget triennal est quelque chose qui se situe entre le budget annuel de l'Etat et la planification à long terme. Les budgets triennaux sont préparés chaque année ; budgets à horizon mouvant, ils constituent en quelque sorte une préparation nécessaire au budget annuel de l'année suivante. Les budgets triennaux constituent également la base permettant aux autorités politiques d'évaluer l'équilibre à réaliser entre les dépenses publiques et les revenus au cours des années à venir. Les modifications des impôts et les problèmes de financement des nouveaux programmes onéreux devraient logiquement être étudiés dans le cadre d'un budget pluri-annuel.

Dans le contexte de cette étude, seules les dépenses courantes de l'Etat sont examinées. Ces dépenses comprennent les subventions accordées aux établissements municipaux et privés qui les utiliseront pour financer en partie le coût de fonctionnement des écoles et des institutions d'enseignement. Non seulement les dépenses totales d'enseignement sont importantes, mais les principes retenus pour le calcul des subventions le sont également. Les possibilités de nouvelles dispositions législatives sont donc parmi les facteurs qu'il faut prendre en compte pour établir un budget triennal.

Les budgets triennaux sont fondés sur des évaluations des facteurs généraux qui déterminent l'évolution des dépenses pour toute branche particulière de l'enseignement. Les prévisions concernant l'évolution de ces facteurs sont donc importantes. Naturellement, les évaluations de coût sont en général moins précises qu'elles ne le sont pour le budget annuel.

Dans le cas de l'enseignement au niveau universitaire, des prévisions ne peuvent pas toujours être utilisées, car les prévisions établies par l'Etat peuvent être remises en cause par les décisions que les universités pourront être amenées à prendre individuellement.

Par contre, les budgets peuvent être préparés sur la base de prévisions dans les branches de l'enseignement tels que : l'enseignement obligatoire, les écoles secondaires supérieures, l'enseignement pour les adultes, les enseignements technique et professionnel et la formation des enseignants.

L'évolution des dépenses dans ces secteurs d'enseignement dépend, dans une large mesure, de l'évolution des effectifs scolaires et universitaires; des prévisions à court terme quant aux effectifs scolaires et universitaires dans les différentes écoles, dans les différentes branches de l'enseignement et aux différents niveaux sont donc essentielles.

La demande d'enseignants est calculée à partir du rapport professeurs/élèves lequel provient des inscriptions et également des prévisions de répartition des élèves par groupes, classes et domaines d'études. Il est évident que la durée de l'enseignement et le nombre des cours données pendant une année sont importants dans ce contexte.

Lorsqu'à partir du nombre de professeurs nécessaires, on estime le volume des dépenses, il faut tenir compte de quelques facteurs complémentaires, à savoir : les règles en matière de durée de travail du corps enseignant et les échelles de salaires dans différentes branches et à différents niveaux de l'enseignement. A ce sujet, il faut signaler que les salaires constituent un poste important du montant total des dépenses courantes de l'enseignement. Les changements qui affectent les obligations d'enseignement d'un professeur, et les changements dans les échelles de salaires, etc. doivent être soigneusement évaluées pour préparer les budgets triennaux.

En raison du manque de renseignements détaillés concernant les autres dépenses courantes, on a pris pour hypothèse que ces dépenses étaient proportionnelles aux salaires versés aux enseignants pendant la période des deux années pendant lesquelles des budgets triennaux ont été préparés au Danemark. Cette hypothèse pour une période aussi courte que trois ans n'est pas déraisonnable ; mais il est évident qu'une analyse beaucoup plus poussée des dépenses courantes serait nécessaire pour explorer les tendances d'évolution des différentes catégories de dépenses.

Une analyse a montré qu'actuellement les dépenses de salaires, et les subventions de l'Etat pour couvrir les dépenses directes de salaires des établissements d'enseignement municipaux et privés représentent 79 % du montant total des dépenses courantes du Ministère de l'Education ; tandis que 5 % du budget représente l'aide financière accordée aux étudiants, et 16 % seulement représente des dépenses autres que les salaires.

La procédure décrite ci-dessus est expliquée et analysée au moyen de la présentation de quelques données de base à partir desquelles le budget triennal de 1968-69 à 1970-71 pour les écoles primaires et secondaires inférieures a été évalué.

Le nombre des élèves et leur répartition entre les classes et les niveaux a été évalué sur la base de statistiques scolaires qui présentent des informations détaillées concernant chaque individu. Les taux de passage entre différents degrés et branches ont été calculés au cours des dernières années, et sur la base de ces taux de passage et de leur évolution future le nombre des élèves a pu être évalué (non seulement au niveau de l'enseignement obligatoire, mais également pour les niveaux supérieurs).

Des renseignements concernant l'offre d'enseignants ont été obtenus à partir de la section qui s'occupe des centres de formation de professeurs. Dans cette section, les chiffres qui concernent l'augmentation de l'effectif des enseignants et les retraits ont été étudiés. Les comparaisons avec les évaluations de demande d'enseignants montrent que le manque actuel de professeurs au niveau de l'école secondaire inférieure et de l'école primaire diminuera considérablement au cours des prochaines années.

Il en résulte cependant un certain nombre de problèmes. A l'heure actuelle, de nombreux enseignants dépassent les 32 heures hebdomadaires prévues et ils reçoivent une indemnité compensatrice de 20 % pour ce travail supplémentaire. Les tendances de la demande et de l'offre d'enseignants, telles que les révèlent les budgets triennaux, pourraient donc provoquer une réduction des possibilités de gain d'un très grand nombre d'enseignants, on pourrait accroître le chômage si les enseignants actuellement en service étaient autorisés à assurer le même nombre d'heures supplémentaires. Il y a, bien entendu, d'autres possibilités, par exemple : une diminution du nombre des élèves par classe, ou des réductions à l'admission dans les écoles normales de telle sorte que leur capacité actuelle ne soit pas pleinement utilisée.

En examinant le problème des enseignants, il faut également tenir compte que les autorités locales n'ont que peu d'intérêt à contrôler la demande croissante visant à obtenir davantage de professeurs et davantage de cours, puisque 85 % de l'augmentation du coût des salaires des enseignants est subventionnée par l'Etat.

Tout un ensemble de problèmes ont donc été mis en lumière dans le contexte de ces travaux sur le budget triennal. Un des résultats de cette analyse sera que les règles gouvernant les subventions de l'Etat aux écoles municipales seront probablement révisées. Une réduction du pourcentage (85 %) de la subvention accordée pour couvrir les salaires des enseignants ainsi que les créations de subventions pour d'autres éléments des coûts seront également étudiées.

On a évalué que l'augmentation annuelle des dépenses d'enseignement pendant la période de trois ans serait de 7 %. Il s'agit cependant d'un chiffre minimal. Les augmentations de salaire et les nouvelles dispositions législatives provoqueront probablement une augmentation de ce chiffre. Comme l'augmentation du produit national brut ne sera que de 3 % par an, les possibilités d'augmenter les dépenses sont limitées. Il est donc particulièrement important que des priorités soient soigneusement établies entre les nouvelles dépenses, et que les possibilités d'économie soient étudiées pour les divers postes de dépenses. L'objectif d'un budget triennal est précisément de fournir la base nécessaire à l'évaluation de considérations rationnelles à ce sujet.

SOME FINANCIAL INSTRUMENTS AND EFFICIENCY INCENTIVES IN EDUCATIONAL POLICY

by Kjell Eide

Contents

A Introduction 147

- I Efficiency Concepts
- II Instruments and Incentives
- III Some Basic Features of Financial Policy Instruments

B Central Government Subsidies to Local Authorities 150

- I Case Description
- II Evaluation of the Present Subsidy System
- III Standard Costs as the Basis for Subsidies
- IV Substituting Financial Instruments for Legal Measures

C Public Support for Students 158

- I Total and Partial Efficiency Impact
- II Objectives for Public Support to Students
- III Financial Instruments Applied in Public Support for Students
- IV Objectives and Instruments

Notes

A. INTRODUCTION

I Efficiency Concepts

The term "efficiency" does not seem to have a unique, generally accepted meaning. A few words about the meanings of this term may, therefore, be a suitable introduction to this paper.

If we have a process in which one single type of output is produced by one single type of input, the number of input units needed to produce one unit of output constitutes a measure of what may be termed the technical efficiency of the process.

If one single type of output is produced by more than one input factor, similar measures of technical efficiency can be established by relating output to the input of each factor. However, the value of each of these measures will depend on the actual input of other factors, none of them providing valid information about the efficiency of the process as a whole.

This "total" efficiency can only be measured if the values of all input factors can be reduced to a common denominator by the help of input prices or other general value indicators. By relating output to the total value of inputs, we obtain a measure of economic efficiency. In economic terms, this measure corresponds to unit costs.

If more than one type of output is produced by more than one type of input, unit costs can be estimated for each type of output. However, such partial efficiency measures are not sufficient to describe the efficiency of the process as a whole. The values of various types of output must be reduced to a common denominator by the help of output prices or other general value indicators. Total output in this sense may then be related to total input, thus providing another economic efficiency measure. In economic terms, this measure is closely related to the concept of profitability.

In this paper, we shall be concerned with the two latter types of (economic) efficiency, relevant to processes with uni-dimensional and multi-dimensional objective functions respectively.

With efficiency concepts thus defined, increased efficiency can only be obtained through a more optimal composition of input factors. If the process involves interactions between several individuals or organizational units, increased efficiency implies that the behaviour of individual bodies participating in the process should show a higher degree of consistency with its objective(s).

II Instruments and Incentives

Changing the behaviour of individual bodies participating in a process means changing the premises upon which the decisions of such bodies are made. Measures intended to cause such changes will here be termed "policy instruments". To the extent that the use of such policy instruments causes a more optimal composition of input factors, thus increasing efficiency, we shall say that they act as "efficiency incentives".

Policy instruments may, of course, also be used in order to influence the total scale of the process, without changing the composition of input factors, or even causing a less optimal composition of such factors. If so, policy instruments do not act as efficiency incentives.[1]

Within the administrative process, questions related to policy instruments may appear to belong exclusively to the field of policy implementation. In practice, however, the availability of adequate policy instruments is essential to the kind of planning assumed to preceed policy decisions. Failure to realize this has led to the lack of any real impact of many plans. Checking the consistency of desired courses of action with the policy instruments likely to be at hand is, in fact, a basic feature of the planning process.

Roughly speaking, policy instruments can be grouped under three headings: legal instruments, financial instruments and informative instruments.

In traditional public administration, legal instruments tend to be given a dominant role. An essential characteristic of such instruments is that they appear to offer possibilities for fixing exactly the immediate consequences of public intervention. Their drawbacks stem from lack of selectivity and flexibility. Often the use of legal instruments is felt as a substantial restriction of freedom of action; consequently, they usually have to be accompanied by extensive controls.

Financial instruments can be made more flexible than legal instruments, influencing the behaviour of individuals without reducing their freedom of action to the same extent. Normally, controls are also less complicated. On the other hand, the impact of such instruments is often assumed to be more uncertain.

Informative instruments have not played a major role in traditional administration. Their impact is, of course, thought to be even more uncertain than that of financial instruments. They are, however, usually inexpensive and create less psychological resistance. Nor do they call for controls, although follow up studies would normally be desirable.

In terms of organization theory, the three types of policy instruments correspond to different ways of exerting authority. However, if the efficiency of various forms of authority is measured by their final impact upon behaviour, empirical evidence underlying organization theory points towards less simple conclusions than those indicated above. Legal instruments may, in certain cases, be practically without any effect, while the use of financial or information instruments may be an indispensable condition for policy implementation.

This is partly explained by the fact that the different ways of exerting authority are closely related to the distribution of decision-making power. A shift from legal to financial instruments is often - though not always - associated with delegation of more authority to lower levels of a decision-making hierarchy. A further shift to information instruments would normally be regarded as another major step in the same direction.

It should then be borne in mind, that the "sum of authority" is not constant. Increased rationality within an organization as a whole, in relation to its general objectives, can logically be interpreted as an increase in the total amount of authority. Thus an increase in authority at lower levels may go well with maintenance of authority at the top level, the only loser being pure chance. Planning, in fact, draws its strongest rationale from this.

Efficient administration is based upon a carefully worked out interplay between the three above-mentioned types of policy instruments. To some extent, they are complementary, in the sense that financial measures often reinforce legal instruments, while informative instruments may reinforce both legal and financial measures.

At the same time, one type of policy instrument may to a considerable extent be substituted for another. By and large, the trend in traditional public administration seems to be towards more extensive use of financial and informative instruments, possibly combined with an actual reduction in the use of legal instruments.[2]

The following discussion of the potential use of financial instruments as a main steering mechanism in certain fields of policy must be viewed against this background. The main alternatives in those cases imply either more extensive use of legal instruments for policy implementation, or a basic change of policy. In this context, informative instruments are mainly thought of as possible means of reinforcing the financial measures in question.

III Some Basic Features of Financial Policy Instruments

The most frequently used of all financial instruments is the subsidy, and we shall here mainly deal with this instrument. Before going further into cases of actual application, we need, however, to recapitulate certain elementary rules[3] connected with the use of subsidies.

The first such rule is that by lowering prices, subsidies tend to increase the demand of those benefiting from the subsidies in general, and their demand for the subsidiced goods in particular.

Consequently, subsidies tend - at least relatively speaking - to twist the demand of the beneficiaries from non-subsidiced to subsidiced goods. The choice of goods to be subsidiced is, therefore, a basic priority decision.

The demand functions of different beneficiaries vary widely. Consequently, the same subsidy will not have the same effect on their behaviour. If a similar effect on all beneficiaries is desired, subsidies must be differentiated according to the circumstances of individual beneficiaries.[4]

Strongly differentiated subsidies may mean that actual prices become very low for some beneficiaries, thus increasing the risk for excessive use of resources. A way of avoiding this is to limit the subsidies to given consumption quotas for each beneficiary. Demand beyond these quotas would then have to be paid at the full price. This form of subsidy, therefore, tends to make demand approach the limit beyond which the subsidy no longer applies.

Subsidies based upon standard costs imply a premium on actual expenditure below the chosen standard and a penalty for expenditure above the standard level. Consequently, this form of subsidy acts as a general *disincentive to demand*.

All the above-mentioned "rules" are well known from elementary economic theory. Stimulating demand, twisting demand, "harmonizing" individual demand functions, and operating double markets (rationing), all these have been extensively dealt with. However, there may still be aspects of these subjects related to the use of financial policy instruments which have not been fully explored.

Before embarking upon such an exploration, we may state explicitly one more elementary "rule" of economics, or perhaps rather of general logic: *If we want to achieve a certain number of non-identical objectives, we need at least the same number of non-identical policy instruments.* This may appear obvious. However, the actual application of financial instruments provides an abundance of examples of violation of this rule, at least if we take seriously the wide range of policy objectives to which lip service is being paid.

B. CENTRAL GOVERNMENT SUBSIDIES TO LOCAL AUTHORITIES

I *Case Description*

In this first case chosen for examination[5], we assume that financial instruments serve one particular objective,[6] thus making our analysis an illustration of the use of financial instruments in a process with a *one-dimensional objective function* (cf. par.7 p.147). Our prime purpose is to study the extent to which this objective can be left to financial instruments alone, or to what extent legal instruments have to be maintained.

The policy objective for consideration may be formulated as:

the same quality of educational supply in all parts of the country.

As an additional constraint, we shall assume that the total "amount" of education[7] is to be "right" according to central government views.

The analysis is restricted to compulsory education. As a further simplification, we shall only deal with subsidies to local authorities related to the current costs of schools. Thus private costs and public expenditure for capital investment, transportation, accommodation and other transfers to individuals are excluded. These limitations have been adopted for practical reasons, since they save us from a number of problems of secondary importance in this context. In principle, however, the following analysis could have been applied to all types of educational costs.

In our case, the initial situation is characterized by the following use of policy instruments by central government.

> Subsidies are given to local authorities according to their actual expenditures on teachers' salaries and to their fiscal capacity, the proportion of teachers' salaries covered by subsidies varying from 25% to 85%.

The main factors determining the input of teacher services, such as the number of hours taught in full class, extra hours taught, class size, teaching obligations, teacher qualifications, teachers' salaries etc. are regulated by legal means. Minimum limits are usually stated in strict legal terms, while maximum limits of the input of teacher services are often set in terms of quotas for subsidy, thus making use of the principle of "double markets"[8].

Generally speaking, the total amount of education offered is mainly determined through legal measures. Only in a few cases (hours taught in full class, school size) are local decisions significantly influenced by financial instruments, and then usually within legally defined min./max. limits.

Equality of education is more strongly influenced by financial measures, but legal instruments also play an important role in this respect, mainly through the definition of minimum requirements.

II Evaluation of the Present Subsidy System

A critical examination of the steering mechanisms outlined above, bearing in mind the "rules" connected with subsidies, leads to the following conclusions.

Differentiated subsidies to local authorities according to expenditures on education imply a policy of stronger emphasis on equality in the supply of education than in the supply of other public services by local authorities. This twisting of the demand of local authorities towards education follows from general government ideas about the "right" amount of education, based at least partly upon assumptions concerning the "external economies" arising from activities in this sector.

The fact that government subsidies are tied to only a part of the educational expenditures of local authorities reduces the possible scope of differentiation according to fiscal capacity. The actual range of subsidy for teachers' salaries - 25% to 85% - is very wide, approaching at the one end a situation in which the subsidy means little in terms of price reduction, and at the other end a situation in which local authorities can have teacher services free of charge[9]. However, in relation to the total current costs of education, the maximum subsidy may still not be sufficient to outweigh differences in fiscal capacity. The restricted basis for the subsidy - chosen for practical reasons of control - may thus be irrational in relation to the equality objective[10].

Furthermore, the choice of teachers' salaries as the basis for subsidy tends to twist the demand of local authorities towards this particular kind of educational input. Legal measures may limit the extent to which this demand is effectuated. It seems likely, however, that the present subsidy system does not encourage a more rational exploitation by local authorities of possibilities for replacing teachers by other, unsubsidised types of inputs.

It is, of course, conceivable that the central government could attach higher priorities to certain types of educational input than local authorities tend to do. This would then justify a selective basis for subsidy. There is no reason to believe, however, that such a difference in priorities do exist as regards teachers in our particular case. The twisting of local authority demand thus tends to create irrational behaviour.

In another respect, however, central government may actually have a different priority as regards educational inputs than would usually be the case with local authorities. Centrally, one may be more aware of the fact that in most fields of education, particularly at the higher levels, the input of pupils' time is an essential factor in education. To society, the cost connected with this factor may be substantial,/11/ but to local school authorities it may appear to be nil. The twisting of demand arising from this may cause an excessive use of pupils' time, and a suboptimal use of other resources. Another aspect of the rationale for central government subsidies to local authorities in order to achieve the "right" amount of education emerges from this situation.

The final criticism we shall raise against the present subsidy system concerns the relating of subsidies to the actual expenditure on teachers' salaries. In such a system, local authorities with high levels of subsidy have very little incentive to achieve an effective utilization of teachers within the limits set by legal regulations. In fact, the present system seems to exert a constant pressure upon those regulations.

Some of the problems involved in the present subsidy system can easily be solved. Choosing total current expenditures as the basis for subsidies would for instance both provide for a wider range of subsidy differentiation and remove the irrational twisting of local authority demand for different types of resources. Should the need arise for the central government to attach special priorities to the use of particular types of resources, it could always be met through a further differentiation of subsidies by type.

As mentioned above, problems relating to the measuring and control of total current expenditures are raised by the suggested shift of basis for the subsidies. However, by and large, these problems can be solved through the introduction of standard costs as a basis for subsidy. There would still be statistical problems involved in the collection of data needed for choosing the level of standard costs. However, since standard costs do not have to be defined in terms of actually observed costs - e.g. the present average - the statistical requirements should not be overestimated.

Basing subsidies upon standard costs also solves the problem of excessive demand. It would introduce a general incentive for local authorities for cost reductions, at least if the minimum level of subsidy were not too low.

It still remains to be examined to what extent such a system of financial instruments as indicated above can be substituted for present legal regulations. The main issue involved in this context is the loss of selectivity implied both by the application of standard costs and by the abolition of legal regulations.

III Standard Costs as the Basis for Subsidies

As a starting point, we shall assume that standard costs are calculated on the basis of chosen standard inputs of all major cost factors. To a great extent, those standards are defined in real terms by the present system of legal requirements.

As long as actual expenditures constitute the basis for subsidies, cost variations due to the different conditions of individual local authorities are automatically taken into account. Standard costs as basis for subsidies mean that such variations are disregarded. Yet to a great extent, such variations arise from circumstances beyond the control of local authorities. The loss of selectivity implied by the use of standard costs may thus lead to a less optimal composition of inputs by local authorities, and consequently lower efficiency in relation to the given objective.

In order to judge the extent to which this is the case, fairly detailed knowledge of the actual cost structure is needed.[12] For each major cost factor, the range of actual variations should be estimated, and the degree of local control of such variations should be examined. In addition, the extent to which various factors are correlated is of major interest in this context.

As a somewhat simplified illustration, we shall here only examine the following major cost factors:

total number of pupils;
grade distribution of pupils;
hours taught in full class;
extra hours;
class size;
teachers' salaries;
purchase of goods and services;

In addition, we shall look into the consequences of variations in the fiscal capacity of local authorities.

The total number of pupils is clearly a factor which cannot be disregarded when the basis for subsidies is determined. The minimum size of a primary school in Norway is 6 pupils, while the biggest schools have more than 1000 pupils. As regards local authorities, the number of pupils in compulsory education within their districts varies from less than 100 to more than 60,000, due to reasons clearly beyond their control. Under such circumstances a useful standard costs concept must obviously be defined as standard costs per pupil.

The grade distribution of pupils is relevant to the extent costs vary according to grade, and the grade distribution varies from one local authority to another. The average annual cost per pupil ranges from 1600-1700 kr. in the lowest grades to nearly 4000 kr. in the 9th grade. However, since we are concerned with compulsory education, the distribution of pupils according to grades varies much less. Significant deviations from the average are mainly found in areas with declining population (agricultural and fishery districts) and with a relatively large number of pupils in the lower grades, and in areas with rapidly growing population (suburban districts) and with a relatively large number of pupils in the upper grades. Obviously, local authorities have no means for manipulating this distribution.

Deviations from the average grade distribution are closely correlated with variations in fiscal capacity. Disregarding such deviations has, therefore, an effect similar to that of a certain differentiation of subsidies according to fiscal capacity. The extent of this differentiation can be fairly accurately estimated.

At present, the number of hours taught in full class varies from 20½ to 26 hours per week in grades 1 to 6, depending upon decisions by local authorities. According to the new nine-year comprehensive school Act, this range will be reduced to 21½ - 24½ hours. For the grades 7 to 9 there will be no variations in the number of hours taught in full class.

Since local authorities can regulate, within limits, the number of hours taught, the introduction of standard costs as the basis for subsidies may lead to a reduced use of this input factor. Whether the result will be a loss in efficiency depends upon the possible substitution of this factor by other input factors with at least an equally high marginal productivity.

The actual variations likely to remain in the number of hours taught in full class will presumably be strongly correlated with the fiscal capacity of local authorities.

"Extra hours" is a cost factor including a number of rather different items: hours taught in divided class, in remedial programmes, by teacher substitutes etc. It also includes the number of teaching hours lost due to the reduction in teaching obligations caused by administrative and other non-teaching duties.

Some of these cost items, such as teaching in divided class, the need for substitutes and the reductions in teaching obligations, cannot be much influenced by local authorities. Nor do these items show systematic variations between local authorities, except for teaching in divided class, the extent of which depends upon school size. Consequently, subsidies based on standard costs are unlikely to influence significantly the actual behaviour of local authorities.

However, they will have a certain impact similar to that of subsidy differentiation according to school size structure. This differentiation will be negatively correlated with fiscal capacity, in the sense that wealthy local authorities are likely to benefit from a subsidy system based upon standard costs.

The amount of remedial teaching/13/ is to a considerable extent determined by local authorities. Standard costs as subsidy basis would then encourage a reduction in such teaching. Since costs per pupil in remedial teaching are likely to be higher in districts with low fiscal capacity, the resulting variations will tend to be negatively correlated with this factor.

Class size as a function of the number of pupils in a school is strictly regulated by central government. The school size structure within a district, however, is controled by local authorities, within the limits set by factors beyond their control, such as the age structure and the distribution of population, communication network etc.).

The range of variations in costs per pupil according to school size is considerable. Teacher costs, for instance, are 2½ times higher in a small, non-graded primary school than in a school with full class-division according to grade. Variations between local authorities are somewhat smaller, but still quite significant, showing a close, negative correlation with fiscal capacity.

Teachers' salaries are regulated by central government in terms of minimum qualification requirements and a common salary scale for the country as a whole. Labour market conditions, including the legal obligation of local authorities to engage the most qualified applicant, determine the actual structure of teachers' salaries.

Teachers' salaries in compulsory education vary mainly according to educational qualifications and the duration of service./14/ The range is at present from about 21.000 kr. to 39.000 kr. per year. The range is narrower between average salaries in different local authorities, but it is still very significant. The variations are strongly correlated with fiscal capacity.

The purchase of goods and services comprises a variety of cost items, mainly controlled by local authorities, but sometimes influenced by general central government regulations. Some items are negatively correlated with fiscal capacity, other positively. Variations in total costs per pupil are thought to be significant, but not substantial.

Variations in fiscal capacity between local authorities depend mainly on the taxable income level, although central government subsidies - general or earmarked for non-educational purposes - play a certain role. Variations in fiscal capacity are substantial, the wealthiest districts reaching a level about three times as high as the poorest. Equalization of the quality of educational supply is thus hardly possible without the differentiation of subsidies according to fiscal capacity.

The findings of this analysis may be summerized as follows.

Factors	Controlled by	Range of variations	Correlation with fiscal capacity
Number of pupils	Exogenous factors	Substantial	
Grade distribution	Exogenous factors	Significant	+
Hours taught in full class	Central government Local authorities	Significant	+
Extra hours			
in divided class	Central government	Significant	-
by substitutes	Exogenous factors	Small	0
for remedial teaching	Local authorities	Significant	-
deduced for administration	Central government	Small	0
Class size	Central government Exogenous factors Local authorities	Significant	-
Teachers' salaries	Central government Exogenous factors	Significant	+
Purchase of goods and services	Mainly local authorities	Significant	+
Fiscal capacity	Exogenous factors (Central government)	Substantial	

As mentioned above, subsidies based on standard costs will have to be differentiated according to the number of pupils and the fiscal capacity of local authorities. Whether other factors can be disregarded without resulting in a significantly less optimal composition of inputs and consequent loss of efficiency, is dependent upon how closely other factors with significant variations are correlated with the two factors mentioned above.

If these correlations are high, subsidies can be based upon costs per pupil, differentiated primarily according to fiscal capacity. The latter factor, however, should be weighted by a coefficient depending upon other relevant factors, taking into account the extent to which such factors counteracts or reinforces the effects of variations in fiscal capacity upon the quality of educational supply.

The table above lists four factors of the former and three factors of the latter type. It is possible to estimate approximately how far the actual variations of each factor will cause a differentiation of subsidies according to fiscal capacity. The appropriate weighting of the fiscal capacity factor can then be estimated correspondingly.

The degree of correlation of the various factors with fiscal capacity may not, however, be the only relevant question in this context. There may also be differences between central and local government as to their conception of the marginal productivity of various inputs. Central government may want to induce certain changes in the composition of inputs controlled primarily by local authorities. The factors in question will then have to be explicitly taken into account as a basis for the differentiation of subsidies.

The school size structure may serve as an example of this. It is quite conceivable that central government may wish to provide only a partial compensation for costs accruing from a particularly expansive school size structure, in order to push local authorities towards what central government considers to be more efficient structures. In our case, the actual subsidy system is, therefore, likely to include information about the school size structure of individual local authorities among the criterions for subsidy differentiation.

In principle, the same may be the case with other factors, such as the number of hours taught in full class. But the chances may be better for the acceptance of standard factor costs as the basis for subsidies in these cases,/15/ since the consequent loss of efficiency - as seen from the viewpoint of central government - may not be regarded as significant.

Subsidies based on standard costs represent a strong incentive for local authorities to reduce the actual input of such factors which they control. Thus the change of subsidy system will tend to reduce the total supply of education by local authorities. Maintaining the "right" general quality level of compulsory education - as judged by central government - means, therefore, increasing the general level of subsidies.

In our special case, however, a constant upward shift at the local level in the demand for increased quality makes a rise in the subsidy level less likely to occur. Instead, the indicated change in the subsidy system may replace an actual cut in the level of central government subsidies.

IV Substituting Financial Instruments for Legal Measures

Until now, our analysis has been based upon the assumption that the present system of legal regulations remains unchanged. We shall now examine the consequences of a substitution of financial instruments for such legal measures.

Clearly, the abolishment of central government restrictions on the use of various inputs would lead to a corresponding increase of control by local government. A distinction should be made between two types of consequences of such changes in the steering mechanism: the impact on the composition of input factors, and the impact on the total demand for educational quality.

Changes in the composition of inputs will occur to the extent that local authorities use input factors beyond the present legal maximum or minimum limits. Apparently, this might lead to a loss in efficiency in terms of the general objectives of educational policy as viewed by central government./16/

Whether such a loss in total efficiency will actually take place is partly dependent upon what may be termed the information/authority balance. Such a balance is achieved when the degree of authority over a certain type of decisions at a certain level of administration is compatible with the access at that level to information relevant to such decisions. If there is reason to believe that such a balance is lacking, a change in the distribution of authority will lead to an increase in total efficiency.

In our case it seems likely that a certain delegation of decision-making power from central government to local authorities may lead to an improved information/authority balance. This is partly due to the wide range in local conditions which cannot be taken into account when factor inputs are regulated by legal instruments.

Furthermore, factual knowledge about the marginal productivity of various inputs is often rather scarce. Variations in the composition of inputs according to somewhat different productivity assumptions may therefore, not necessarily imply lower efficiency than a more strictly regulated composition. On the contrary, a systematic testing of alternative combinations of inputs may be essential for an increase in efficiency of the total process.

In addition, increased responsibility for the input composition at local levels (local authorities, individual schools) may be thought to have a constructive impact on such factors as motivation and pedagogical insight, thus indirectly contributing to an increase in total efficiency./17/

In practice, a reduction in the use of legal instruments may well be introduced gradually. The range of local authority control may be expanded while still maintaining certain legally defined limits. How far one should go in this direction depends upon the assumed degree of consistency between objectives and assumptions about ends/means relationships at the central and local levels.

The use of standard costs as the basis for subsidies is likely to reduce the need for maximum limits of input factors (maximum number of hours taught in full class, maximum number of hours taught in divided class, maximum reduction of teaching obligations due to non-teaching duties, minimum class size etc.). The general incentive for reducing factor input may, however, call for continued or even extended use of minimum limits of input factors.

This need for legally defined minimum inputs may be considerably reduced if local authorities are put under the general (legal) obligation to spend for educational purposes a sum corresponding at least to standard costs. Such a minimum limit would then relate not to any single input factor, but to the total costs calculated as the sum of all standard inputs.

Such a legal obligation by local authorities would be easy to control, and it would make major deviations from an optimal composition of inputs highly unlikely. Extended use of informative instruments might further reduce the need for legally defined limits.

As a conclusion to this part of our analysis, we suggest that a system of central government subsidies based on standard costs and differentiated according to a few major factors (primarily the number of pupils and fiscal capacity) can be introduced without a significant loss of efficiency in relation to the stated objective.

Furthermore, such a subsidy system may in our case to a great extent replace the present system of legal regulations of educational inputs. It seems likely that such a substitution would lead to a significant increase in total efficiency with regard to the general objective function of educational policy, obtained both through an improved information/authority balance, and an improved motivation and insight at the local level.

It should be noted, however, that these conclusions are drawn from factual information relating to one particular country. The results of a similar analysis for another country may not be the same.

C. PUBLIC SUPPORT FOR STUDENTS

I Total and Partial Efficiency Impact

Given our definition of policy objective, our analysis of central government subsidies to local authorities illustrates a process with a uni-dimensional objective function. Our next example, dealing with public support to students, is intended as an illustration of a process with a multi-dimensional objective function.

As mentioned in the introduction to this paper, measuring the total efficiency in this latter case requires a set of value weights ("output prices") to be attached to the components of the objective function. Only then can the different components be brought down to a common denominator, thus permitting the total efficiency to be measured.

In the following analysis, however, we shall not go as far as to attach such normative weights to the various potential components of an objective function for public support to students. We shall limit the analysis to an examination of the impact of various types of financial instruments upon each of the components of the objective function. Thus, in terms of efficiency, we shall only discuss what we have previously termed the partial efficiency in relation to each component (cf. p.147).

Even if we thus leave the choice of value weight of the various components of the objective functions to be determined by the political preferences of the final decision-makers, certain conclusions may still be drawn directly from our analysis. If, for instance, a specific type of financial instrument shows the same impact as or a stronger impact than another type of instrument upon all measures of partial efficiency, the former instrument is preferable, irrespective of political preferences.[18]

II Objectives for Public Support for Students

A vast number of individual objectives - components of an objective function - can be served by public support to students. In the following we have chosen for more systematic analysise five such objectives, which tend to appear fairly regularly in statements on policy in this field:

a. stimulating demand for education in general;
b. stimulating demand for education from particular groups;
c. increasing the effective utilization of students' time;
d. promoting student independence;
e. improving the conditions of graduates.

Other possible objectives may be influenced by particular types of policy instruments. To the extent that this is the case, an attempt will be made in what follows to specify such effects. As to the five objectives chosen for general analysis, a few comments may be appropriate.

a. Stimulating demand for education is an objective often referred to as a reason for reducing the "price" of education to the individual. As mentioned above, the assumption that, in welfare terms, considerable "external economies" arise from education lies behind this argument (cf. par.5 p.151). Still, in a given situation, it is the ideas of central government about the "right" amount of education[19] which determine whether demand for education is to be further stimulated or perhaps moderated.

In this context, short term and long term objectives do not necessarily coincide. Even if, in the long run, increased demand is regarded as desirable, the present demand may be found to exceed supply possibilities in the short term. Temporary measures to reduce demand may thus be called for.

b. The wish to stimulate the demand of particular groups does not necessarily coincide with a wish to increase demand in general. Primarily, this objective aims at a change in the composition of demand. The rationale for this may be a wish for increased social justice, for better utilization of talent resources, or for both.

Even this objective may conceivably have a negative sign. There are at least historical evidence of policies based upon the view that equalization of educational opportunity has gone too far.[20]

c. More effective utilization of students' time may often be achieved through easing their financial situation. This should make it less tempting to combine studying with paid work, and thus reduce the duration of studies. It should also improve the students' welfare level, and consequently their working conditions during studies.

Even this objective may, however, raise certain doubts. Generous public support to students could conceivably reduce their motive for rapid completion of their studies. Furthermore, within a given educational budget, more support to students may be less effective in terms of total efficiency than greater input of other factors, e.g., teacher time. A more optimal composition of input factors does not necessarily require more support to students or less input of students' time.

d. Promoting students' independence appears to many groups, not least to the students themselves, as a natural objective in supporting students. There is no doubt that the present system of financing education in most countries makes students more dependent than other youths of the same age upon their families, at least in economic terms. This may not be accepted as the best way of educating a nation's future intellectual elite.

Still, it cannot be excluded that to some groups, the maintenance of family ties may appear more important than the argument above. At least, such views have been put forward in somewhat similar contexts.[21]

e. Improved conditions for graduates may be regarded as a side-effect of certain measures primarily intended to influence the situation of students. However, this could be regarded as an important objective in itself, as young graduates from the most time-requiring studies may be thought to need support. Often, such graduates start a family and must set up house at a time when study debts have to be repaid and their salaries are still fairly low. Making this particular burden easier to carry might be felt as a cause worthy of public support.

On the other hand, some groups may put more emphasis on the relatively generous life earnings of such highly qualified graduates. They may then be more concerned with the need to support other low income groups which have no such chance of economic compensation in the later stages of their careers.

As shown above, all five objectives chosen for examination may in principle be given positive or negative value weights, depending upon political preferences. This should be borne in mind when, in the following analysis, the partial efficiency of various financial instruments is being examined in relation to each of these objectives. Thus a negative impact on the partial efficiency with respect to one of these objectives is desirable, if one prefers to attach a negative value weight to that particular objective.

III Financial Instruments Applied in Public Support for Students

Two basically different types of financial instruments will be examined here: subsidies and loans. Subsidies will be further divided into two groups according to who the prime receivers are - the families of students or the students themselves. Two aspects of loans to students will be considered: their availability, and the conditions attached to them.

In principle, the various types of instruments can be further subdivided in terms of the criterion according to which they are allocated.[22] The following criterions will explicitly be taken up for examination: per capita, cost of study, needs, ability to repay, geographical origin, geographical destination, field of study, health condition, and study performance.

Many more criterions could be, and have in fact been, applied as a basis for student support, such as sex, race, religion, political views etc. However, for practical reasons, a limit has to be set, and the criteria specified above should be sufficiently representative to serve as an illustration.

As a further limitation, for each type of instrument we shall only examine the most frequently used of the criterions specified above. In certain cases, however, it may be necessary to examine more carefully the measures applied, in order to identify the kind of criterion underlying the actual allocation.

Subsidies to families of students most frequently take the form of selective family allowances of tax concessions, based on the fact that the student constitutes an economic burden for the family. Family allowances may be allocated according to needs[23] or per capita. Tax concessions, in a system of progressive taxation, increase with increasing income, thus implying an allocation according to lack of needs or needs with a negative sign.

Free instruction, in the sense that institutional costs are paid from public funds, is in fact a subsidy allocated according to costs of study. However, since only institutional expenditures are taken into account, variations in costs due to different duration of studies are not fully taken into account.

Free services for students, such as housing and meals, are often selective subsidies, primarily allocated on the basis if a distinction between residential and non-residential students. Free travel is a form of subsidy even more clearly based on the criterion of geographical origin of students. In a similar way, free health services constitute a subsidy according to the need for such services. In contrast, health insurance based on "business-like" risk calculations may easily amount to an allocation according to the lack of need for such services.

Correspondingly, loan availability based upon expected ability to repay, in accordance with "sound" banking principles, in fact means allocation of benefits according to the lack of need for such benefits.

Allocation according to geographical destination may take the form of subsidies committing the beneficiary to spend a certain time after graduation in specific geographical areas. It is being used in countries with peripheral, low income areas to which highly qualified manpower is not easily attracted.

In a similar way, allocations according to the field of study are used as a means of attracting students to fields which tend to be regarded as less attractive.

Lastly, allocations according to study performance aim at stimulating such performance. However, since high performance usually implies increased income opportunities, the effect of such a criterion will often be allocation according to lack of needs.

IV Objectives and Instruments

We shall now consider the objectives for student support, as set out on page 159, in the light of the various policy instruments indicated in paragraph 7 and 8 p. 160. First, however, we shall need a basis for comparison.

Our starting point is the assumption that support for students is to be increased by a given sum. In order to judge what policy instruments to use, we shall compare the effects of various instruments with those of a *per capita* allocation to all students.

The conclusions of this analysis are summarized in the following table. Implicitly assuming that the value weights of the chosen objectives have positive signs, we indicate greater partial efficiency with reference to a particular objective by the sign +, and lower partial efficiency by the sign -. Consequently, the impact of a *per capita* allocation is indicated by 0 with reference to all the specified objectives.

To compare subsidies and loans, we shall take into account only the money value of such loan conditions which the student could not obtain in the regular credit market, including the estimated value of loans availability at the level of security offered by students.

	Objectives*					
Instruments	a	b	c	d	e	Additional objectives
Subsidies						
To Student Families						
Per Capita	0	0	-	-	-	Equalizing family costs
Based on Needs	+	+	?	-	?	General social equalization
Tax Concessions	-	-	-	-	-	Increasing net income differentials for student families
To Students						
Per Capita	0	0	0	0	0	-
Free Instruction	(-)	(-)	+	0	+	Freer choice between fields of study
Based on Needs	+	+	+	0	+	Increased social mobility
Geographical Origin	(+)	(+)	(+)	0	(+)	Geographical equalization
Geographical Destination	(+)?	(+)?	(+)?	-	(-)?	Better distribution of qualified manpower
Field of Study	(+)?	(+)?	(+)?	-	(+)?	Better professional distribution of talent
Health Conditions	0	0	+	0	(+)	General improvement of health
Study Performance	-	?	+?	0	-	Higher study achievement
Loans to Students						
Availability						Straining credit markets. Influencing student attitudes to inflation
Per Capita	0(-)	0(-)	0(-)	0(-)	0(-)	
Based on Needs	(+)	(+)	(+)	0(-)	(+)	
Repayment Ability	-	-	-	(-)	-	Reducing social mobility
Tax Concessions	-	-	-	(-)	-	Increasing net income differentials for graduates
Low Rent	0(-)	0(-)	0(-)	0(-)	?	See loan availability
Amortization Period	0(-)	0(-)	0(-)	0(-)	?	" " "
Amortization Requirements						
Based on Needs	?	?	?	?	+	Social equalization

* See par. 2 , p. 159

Per capita allocations of subsidies to student families serve the same objectives as *per capita* subsidies to students. Since the family allowances are tied to the condition that the student actually does study, one would expect the impact on the demand for education to be the same. However, since such allowances are disposed of by the family, they might be assumed to have less effect upon the effectivity of studies, student independence and conditions of graduates.

Subsidies to student families based on needs have the same relation to *per capita based family allowances as student subsidies based* on needs to *per capita subsidies*. Demand for education may be expected to rise, not only in general terms/24/ but even more on the part of low income groups. In relation to efficacy of studies, allowances based on needs are likely to mean more to those receiving them than a *per capita* allocation. However, it is difficult to say whether this advantage can outweight the disadvantage due to the fact that it is the family who disposes of the allowance. Correspondingly, a question-mark may be attached to the impact on conditions for graduates, while the loss in student independence due to family control of the subsidy remains.

Tax concessions clearly allocate a given amount in a way that provides for *less demand for education* than a *per capita* distribution. This is particularly the case with regard to low income groups. Since such subsidies are primarily given to those potential beneficiaries to whom they mean least, the impact upon efficacy must also be negative. In a similar way, even the two last objectives are less efficiently served by this instrument than by a *per capita* allocation.

Free instruction has, as mentioned previously, the effect of a subsidy allocated according to the institutional costs of studies. In relation to *per capita* subsidies, this instrument twists the demand for education towards more expensive studies, thus increasing the average cost per student. This would imply a certain negative impact upon the demand for education. On the other hand, by cutting particularly the highest educational costs, subsidies are concentrated where they may mean most to demand. Which tendency is the stronger, depends upon whether demand is primarily directed towards a particular type of study or towards studying in general. If the latter is the case, the impact upon demand is likely to remain negative. By cutting the highest costs, free instruction may, however, be more efficient than *per capita* subsidies with regard to study effectiveness and conditions of graduates.

Subsidies based upon the geographical origin of students, such as special grants for students staying away from home, subsidised housing, meals and travel, etc., tend to increase total costs of education. At the same time subsidies are concentrated on those for whom costs are highest, and for whom cost reductions mean most. If, in addition, geographical distance from educational institutions is correlated with income, the final impact of such subsidies may be increased demand. Under such circumstances, the impact on the efficacy of studies of students and conditions of graduates would also be positive, while no impact on student independence would be expected.

The impact of *subsidies according to geographical destination* would only differ from that of *per capita* allocation to the extent that students likely to accept such subsidies show a systematic deviation in terms of needs. If so, they may increase efficiency in relation to the three first objectives. Student independence is likely to be reduced, and the conditions of graduates, although improved due to allocations based on needs, would suffer from the restricted freedom of choice.

The impact of subsidies according to the field of study would be somewhat similar to that described in the previous paragraph. Conditions of graduates, however, would hardly be negatively affected in this case.

If bad health is assumed to show a random distribution between students, subsidies in terms of free health service would have the same impact on demand as per capita subsidies. In terms of efficacy of studies, and possibly also of conditions of graduates, the former type of subsidies would be more efficient.

Subsidies according to study performance are intended to stimulate such performance. Even if in certain student milieus,[25] doubts have been expressed as to the real impact of such measures, one might assume that they would lead to increased efficacy of study. Those qualifying for performance subsidies must be assumed to be keener on studying than the average student. Consequently, the effect of such subsidies upon the demand for education is likely to be negative. If, however, potential students from lower income groups have a higher ability level than the average,[26] and consequently more chances to obtain performance subsidies, the negative effect upon the demand from such groups may be compensated. As to the conditions of graduates, performance subsidies, as indicated previously, are quite likely to imply an allocation according to lack of needs.

Loan availability based on needs or allocated equally to all students may be expected to have effects similar to those of subsidies based on needs or per capita subsidies.[27] It cannot be excluded, however, that loans, even on very generous terms, may meet a psychological resistance far beyond what seems rational from an economic point of view, in particular among students from lower income groups. Their actual effect on demand from such groups may thus be less than the impact of what we would regard as subsidies of equal value.

Two more general issues have been raised in connection with the general availability of loans to students. First, equality between subsidies and loan benefits from the students' point of view may differ from the viewpoint of general finance policy.[28] Second, the fact that in some countries the overwhelming majority of the intellectual elite have obtained - through loan financing of studies - a personal interest in continued inflation, has been the cause of a certain amount of worry.[29] In choosing between subsidies or loans as policy instruments, such considerations may be of some importance.

Loans made available according to repayment ability - although by definition under more generous conditions than in the normal credit market - can be assumed to have effects similar to a subsidy based on lack of needs.

Tax concessions in connection with amortization of calculated study costs, actual repayment of loans, or the payment of interest on loans, are likely to have similar effects to those of tax concessions for student families (par. 3 , p.163). However, to the extent that such subsidies are related to the real burden of debt, the relationship to lack of needs may be somewhat weaker. Still, if tax progression is significant, an equal per capita reduction of debts incurred through previous subsidies is likely to be more efficient, even in terms of improving conditions for graduates.

Low rent and long amortization periods have effects similar to those of loan availability, depending on the criteria used for allocating those benefits. It might perhaps be assumed that, if generous loan conditions are generally less efficient than student subsidies for objectives a-d, the opposite may possibly be the case with regard to the conditions of graduates.[30]

Generous amortization requirements, e.g., in terms of reducing actual repayment commitments, may have an even stronger effect on the conditions of graduates, in particular if such generosity is based upon the actual economic situation of the graduate.[31] In this case, even the difference in the psychological reactions towards subsidies and loans may disappear.

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*   *

The objectives and instruments taken up for special examination here have been selected from official statements and actual practices of several countries. This is one of the reasons why we have not based our analysis in this part of the paper upon actual data from any one country.

Another reason for this is the difficulties involved in obtaining comprehensive, official statements as to the objectives public support for students is intended to serve. It should be pointed out, however, that these difficulties may call for another type of analytical exercise. Instead of asking what impact various instruments may have upon given objectives, the analysis may be reversed, asking what objectives are compatible with a given policy.

This kind of analysis might be quite rewarding, and could be based on the type of approach outlined in this paper. To the extent that objectives deduced from actual policies appear to be in conflict with whatever official statements may say on such objectives,[32] this kind of analysis might provide rich food for further thought.

NOTES

/1/ Although in the latter case, a policy instrument may be said to act as a negative efficiency incentive.

/2/ See, for instance, Eide: "The Planning Process", Proceedings of the Phi Delta Kappa Conference on Educational Planning in Mineapolis, November 1967.

/3/ These "rules" should not be regarded as absolute. There are exceptions well known from economic theory, e.g., cases of positive correlation between price and demand. Such exceptions, however, should not be of major concern in this context.

/4/ When subsidies are used as an instrument in educational policy, the attempt to achieve the same behavioural effect on all beneficiaries is often related to the concept of "equal opportunity".

/5/ In general terms, the case examined here corresponds to the actual situation for compulsory education in Norway.

/6/ Several other objectives do, of course, exist, the assumption in this context being that they should be served by other policy instruments.

/7/ The total "amount" of education is in this context assumed to imply both its qualitative and quantitative aspects.

/8/ These legal regulations are more or less "watertight", both in terms of a certain amount of legally admitted local freedom, and in terms of possibilities for minor "illegal" deviations escaping control.

/9/ The fact that teachers pay about 20% of their salary in taxes to the local authorities, indicates that maximum subsidy in fact more than covers actual teacher costs.

/10/ Data on differences in fiscal capacity between local authorities in Norway indicate that this is actually the case.

/11/ The cost of pupils' time is, in fact, the biggest cost item at all levels in education above minimum working age.

/12/ In the Norwegian case, detailed cost models have been worked out for primary and secondary education. For an illustration of certain aspects of such models, see K. Eide, "The Demand for and Supply of Teachers. A Case Study in the Application of Teacher Demand and Supply Models in Norway". OECD Document, 1967.

/13/ This "amount" varying not only according to the needs for such teaching, which may not show too big differences between districts, but primarily according to the way such teaching is organized.

[14] Other factors, such as special administrative or other professional duties, also play a certain role.

[15] A standard teachers' salary, based on the estimated average, has actually been used for calculating the subsidy basis for compulsory education in recent year.

[16] We have here dropped the assumption of education as a process with a one-dimensional objective function (cf. footnote [6]). Consequently, our efficiency concept is from now on the "total" efficiency of the educational process as a whole.

[17] The arguments put forward in paragraphs 3 to 6 (p. 157) in fact add up to the conclusion that an increase in the total "sum of authority" may be achieved by the suggested change in the system of policy instruments (cf. par. 1, p. 149)

[18] This kind of analysis is in a way parallel to the search for Pareto-optima in welfare theory.

[19] The amount of education thought to be "right" in relation to other instruments applied to promote the general policy objectives of a country. This amount changes, of course, over time.

[20] There is some reason to suspect that similar views may still partly inspire excessive fears of a decline in student quality as a necessary consequence for further democratization.

[21] Thus the introduction of a general old age security scheme in Switzerland was strongly opposed some years ago, on the grounds of its assumed negative effects on family ties.

[22] A comparison may be made with the basis for subsidies discussed in part B of this paper.

[23] The specific criteria may, for instance, be family income or the number of non-working children.

[24] This is based on the assumption that demand structures are somewhat similar in various income groups. It is conceivable, however, that in certain countries, and related to certain types of education, demand structures may vary so strongly between different income groups (or perhaps rather social classes), that subsidies based on needs do not increase demand. The demand for general secondary education in the Netherlands is said to have had such characteristics in recent years (see Ruiter, "The Past and Future Inflow of Students into the Upper Levels of Education in the Netherlands" in Social Objectives in Educational Planning, OECD Paris 1967).

[25] Norwegian student organizations have for instance tended to deny the potential efficacy impact of performance subsidies referring to its assumed negative effects on the student "collective".

[26] Higher ability level of students from low income groups may emerge from a far more rigorous selection. Norwegian data do not provide convincing evidence to this effect, but data from other countries may do so.

[27] This does not mean, of course, that loans have the same effect "per krone" as a subsidy. However, comparing only the money value of special benefits attached to student loans with the money value of subsidies, (cf. par. 3, p. 162), we have in a sense "defined away" perhaps the most important difference between the two basic types of support; that loans have to be repaid.

[28] This implies, of course, a certain lack of consistency between the financial policy of government and the policies of individual credit institutions.

[29] This is, for instance, said to be one of the reasons why loans to students in Sweden do not carry interest. Instead, repayment is adjusted to changes in the general price level.

[30] This assumption depends, however, on the influence of subsidies upon the expenditure levels of students. If debts are reduced accordingly, generous loan conditions will not be more efficient in improving the conditions of graduates.

[31] Even in this case Sweden may serve as an example. The present regulations for loans to students make the commitment for graduates to repay dependent upon a certain income level. If the income of a graduate in a certain year is below this level (about the average of workers' salaries), repayment is postponed, and eventually written off.

[32] Such conflicts are quite likely to stem from violations of the general rule about numbers of objectives and instruments mentioned in par. 3, p. 150 above.

LES STIMULANTS ÉCONOMIQUES ET LES INSTRUMENTS FINANCIERS EFFICACES POUR UNE POLITIQUE DE L'ENSEIGNEMENT

par Kjell Eide (Résumé)

Concept d'efficacité

Admettons que nous ayons un processus dans lequel un seul type d'output résulte de l'utilisation de divers facteurs d'input, en ce cas on obtiendra des évaluations différentes d'efficacité technique en reliant l'output alternativement à chacun des facteurs d'input. Toutefois, le résultat de chacune de ces évaluations dépendra de la quantité réelle d'input des autres facteurs sans qu'aucun d'eux puisse fournir des renseignements valables sur l'efficacité de l'ensemble du processus. Cette efficacité "globale" ne peut être mesurée que si les valeurs de tous les facteurs d'input peuvent être mises sous forme d'un dénominateur commun par l'intermédiaire des prix des inputs ou d'un autre indicateur général de valeur. En reliant l'output à la valeur globale des inputs nous obtenons un moyen de mesurer l'efficacité économique.

Si plusieurs types d'output résultent de l'utilisation de plusieurs types d'input, les valeurs des divers types d'output doivent être mises sous forme d'un dénominateur commun su- la base des prix des outputs. L'output global ainsi défini et l'input global peuvent alors être compérés, ce qui permet de procéder à une autre évaluation de l'efficacité économique.

Dans cette étude nous traiterons des deux types d'efficacité économique mentionnés ci-dessus, et qui ont trait à des processus ayant respectivement des fonctions objectives à une dimension et à plusieurs dimensions. Si on utilise de tels concepts d'efficacité, une efficacité plus grande ne peut être obtenue que par une répartition améliorée des facteurs d'input. Si le processus met en cause des interdépendances entre plusieurs individus ou plusieurs unités d'organisation, une efficacité accrue signifie que le comportement des unités individuelles participant au processus témoigne d'un degré plus élevé de cohérence avec l'objectif, ou les objectifs, de ce processus. Changer le comportement des unités individuelles signifie que l'on change les hypothèses à partir desquelles sont prises leurs décisions. On appellera "instruments de politique" les dispositions destinées à obtenir de tels changements. Quand de telles dispositions augmentent l'efficacité, elles agissent comme des "stimulants de l'efficacité".

Analyser la cohérence de plusieurs possibilités d'action avec les instruments de politique qui seront probablement disponibles c'est, en fait, accomplir une des tâches fondamentales du processus de planification. D'une façon générale les instruments de politique peuvent être regroupés sous trois rubriques :

- les instruments de caractère juridique,
- les instruments financiers, et
- les instruments d'information.

Les instruments financiers peuvent être d'une utilisation plus souple que les instruments de type juridique : ils influenceront le comportement des individus sans pour autant réduire leur liberté d'action.

Du point de vue de la théorie de l'organisation, ces trois catégories d'instruments de politique correspondent à différentes méthodes d'exercice de l'autorité ; ils sont étroitement reliés à différentes répartitions du pouvoir de décision. Abandonner les instruments juridiques pour les instruments financiers signifie souvent, bien que ce ne soit pas toujours le cas, que l'on déléguera un plus grand pouvoir de décision aux niveaux inférieurs de la chaîne de commandement.

Une administration efficace est fondée sur un dosage soigneusement calculé des trois catégories d'instruments de politique mentionnés ci-dessus. Dans une certaine mesure ces instruments sont complémentaires, c'est-à-dire que les mesures financières renforcent souvent les instruments juridiques, tandis que les instruments d'information peuvent renforcer à la fois les mesures d'ordre juridique et les mesures financières.

En même temps, un certain type d'instruments de politique peut dans une très large mesure remplacer un autre type. Il semble que dans l'administration publique la tendance soit d'utiliser davantage les instruments financiers et d'information, tandis que l'utilisation des instruments juridiques se trouverait réduite.

Subventions du Gouvernement Central aux Autorités locales

Dans ce qui suit, on ne traite que de l'enseignement obligatoire. Au départ, la situation est caractérisée par l'utilisation des instruments de politique par le gouvernement central d'après le schéma qui suit :

> "Les subventions sont accordées aux autorités locales sur la base de leurs dépenses réelles pour couvrir les salaires des enseignants, et d'après leurs possibilités de lever les impôts ; (la proportion des traitements des enseignants couverts par les subventions s'établissant entre 25 % et 85 %). Les principaux facteurs qui déterminent l'input des services des enseignants tels que le temps de service dans les classes à temps complet, les heures supplémentaires d'enseignement, le nombre d'élèves par classe, les obligations d'enseignement, les qualifications et les salaires des professeurs, etc. sont déterminés par les voies juridiques".

Le fait que les subventions de l'Etat ne couvrent qu'une partie des dépenses d'enseignement des autorités locales, réduit le champ des possibilités de différentiation selon leur capacité de lever l'impôt. En outre, le critère du salaire des enseignants comme base des subventions a tendance à détourner la demande vers ce type particulier d'input de l'enseignement.

Quelques uns des problèmes du système actuel de subventions peuvent être aisément résolus. Si l'on retenait le total des dépenses courantes pour base des subventions, ceci permettrait à la fois d'obtenir des critères plus complets pour différencier les subventions, et on éviterait ainsi les distortions irrationnelles des demandes exprimées par les autorités locales à l'égard de différentes catégories de ressources.

Le changement que l'on suggère pour déterminer la base des subventions crée des problèmes en ce qui concerne l'évaluation et le contrôle du total des dépenses courantes. Toutefois, ces problèmes peuvent être résolus en introduisant des coûts normalisés pour calculer les subventions. D'autre part, fonder les subventions sur des coûts normalisés résoud également le problème des demandes excessives, en raison de prix peu élevés et de la haute élasticité de la demande qui en résulte.

Pour autant que les dépenses réelles constituent la base des subventions, les variations de coût qui reflètent les conditions différentes des autorités locales individuelles sont automatiquement prises en compte. Puisque ces variations résultent de circonstances qui sont hors du contrôle des autorités locales, les coûts normalisés devraient, si possible, prendre en compte ces variations inévitables.

L'utilisation des coûts normalisés pour base des subventions résoudra vraisemblablement le besoin d'établir des limites maximales d'utilisation des facteurs d'input (temps de service maximum dans des classes à temps complet, effectif minimum d'une classe, etc.).

Une des conclusions de l'analyse présentée dans ce document est de proposer un système de subventions par le gouvernement central qui seraient fondées sur des coûts normalisés et qui seraient différenciés suivant un nombre limité de facteurs importants (en premier lieu : l'effectif scolaire et la capacité de lever l'impôt). Un tel système de subventions peut, dans notre cas, remplacer dans une large mesure le système actuel qui règle les inputs de l'enseignement par des voies juridiques. Il est vraisemblable que la substitution envisagée se traduirait par une beaucoup plus grande efficacité globale.

Soutien de l'Etat aux étudiants

L'étude examine également les divers objectifs que devrait poursuivre un programme d'aide de l'Etat aux étudiants, ainsi que l'efficacité de différents instruments financiers pour accorder ce soutien.

COST-BENEFIT AND COST-EFFECTIVENESS ANALYSES OF EDUCATION

by Mark Blaug

Introduction

Of all the techniques of investment appraisal which in recent years have come to be applied to the public sector, none has attracted more attention than cost-benefit analysis. Although the underlying concepts have been familiar to economists since the turn of the last century, the subject as such was only born in the 1950's as a result of attempts to rationalise the large-scale development of major river valleys in the United States. Since then, the technique has been applied to virtually all nationalised industries, military defence, health expenditures, housing schemes, traffic networks, land use and town planning problems, regional development and, of course, education in both the United States, the United Kingdom, and indeed in almost all developed and developing countries(1). These developments, however, have been beset with a certain "Babel of Tongues" and many non-economists are still confused between such terms as "cost-benefit analysis", "cost-effectiveness analysis", and "discounted cash-flow techniques", not to mention such related management techniques as "programme-budgeting", "performance budgeting", "systems analysis", "network analysis" (also known as "critical path method" and "P.E.R.T." - programme evaluation and review techniques), "operations research", and "linear programming". A useful way of introducing our discussion is to sort out the meanings of these various terms. I begin, therefore, with some definitions.

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(1) For an excellent review of the field, including a comprehensive bibliography of 90 items, see A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey", Economic Journal, December, 1965, reprinted in Surveys of Economic Theory, Volume III, Resource Allocation. London: Macmillan, 1966, supplemented by G.H. Peters, Cost-Benefit Analysis and Public Expenditures. Eaton Papers 8. London: The Institute of Economic Affairs, 1966, and A. Williams, Output Budgeting and the Contribution of Micro-Economics to Efficiency in Government. CAS Occasional Papers 4. London: H.M.S.O., 1967.

Definition of Terms

In one sense, cost-benefit analysis is an attempt to do explicitly what the price mechanism does implicitly. In a competitive market economy, the efforts of entrepreneurs to minimise costs and to maximise returns on capital invested result in a set of prices which reflect both the opportunity costs of different goods and services - the most valuable use to which the resources devoted to their production might otherwise have been put - and the sacrifices that consumers are prepared to make to obtain them; prices are simply the weights that are assigned to the costs and benefits of activities by all participants in the market process. By contrast, in all countries a whole range of government services are normally supplied without prices being charged for them; even if the inputs into the public service are purchased in markets, the output is not sold in markets and, furthermore, the service in question may not be produced at all by the private sector - motorways are a typical example. In all such cases, there are no prices in terms of which benefits can be evaluated. Even if comparable services are being produced in the private sector - private medicine in countries that have a National Health Service - the prices generated by the market mechanism will rarely serve as suitable weights for appraising the output of the public sector, for the simple reason that government activity in the field usually arose in the first place as a response to "market failure".

"Market failure" refers to any cause that leads to inefficient resource allocation under conditions of perfect competition; that is to say, starting with any distribution of income you like, and even granting profit-maximising producers and utility-maximising consumers, each endowed with perfect knowledge of all possible perfectly certain outcomes, the existence of either (1) internal economies of scale, or (2) external effects in production or consumption, or (3) "collective goods" results in a divergence between private and public benefits, such that interference with the market mechanism is capable of making at least some people better off without making anyone else worse off - the latter is the economic definition of "inefficient resource allocation"(1).

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(1) For the non-economists, we may add that all definitions of "efficient resource allocation" in the end boil down to the proposition that all resources should be equally productive in every possible use. If there are internal economies of scale in any industry, this condition is violated because we could have more output from given resources by shifting them to that industry. Similarly, if some activities generate external benefits (costs) which cannot be marketed because they cannot be confined to individual agents, we would all be better off if more (less) of these activities were carried out. Lastly, if there are goods all of whose benefits are truly indivisible - the more there is for one person, the more not the less there is for someone else - everyone is motivated to avoid payment for them, on the grounds that they are forthcoming whether one pays for them or not; "collective goods" simply cannot be priced in markets and their provision must be determined by the ballot box (more on this anon).

Almost all of the growth of the public sector in modern times could be interpreted as a response to one or more of these three great instances of market failure. Clearly, if a National Health Service is an attempt to overcome social underinvestment in health resulting from private transactions in medicine, it would be a mistake to evaluate the benefits of public hospitals in terms of the prices charged by private nursing homes: these prices do not reflect the external benefits of health expenditures, the existence of which is the rationale for the National Health Service. That is to say, in almost all cases in which the output of the public sector can be evaluated by means of prices of comparable private activity, these prices are not the weights we are looking for; and for the rest, there simply are no market-generated prices to do the job. Nevertheless, if we are to choose one public activity over another, or a public activity over a private activity, we must find some way of comparing costs and benefits, and this is only logically possible if they can be expressed in terms of a common denominator. Given the physical heterogeneity of costs and benefits, a satisfactory common denominator will almost always take the form of a sum of money. In short, we can hardly get away from prices as measures of the costs and benefits of public-sector activity and yet these prices cannot be simply taken from the real world. This is, indeed, the *pons asinorum* of cost-benefit analysis.

We will now define "cost-benefit analysis" as a technique of appraising those public investment projects that compete at least in part with similar projects in the private sector; hence, the market mechanism does generate prices for that kind of activity which can be used to translate the benefits of the project into terms directly comparable to its costs. To be sure, these prices will have to be adjusted to take account of one or more reasons for "market failure" - hence the standard reference to "shadow prices" - but, at any rate, they give us a base from which to start. "Cost-effectiveness analysis", on the other hand, is defined to pertain to public investment projects that are *sui generis*; here the output of the activity cannot be expressed in monetary terms because there is no market whatsoever in which such output is priced(1). A favourite example is national defence; it is not merely that defence programmes are not bought and sold, but rather that national defence, being a "collective good", consumers could never be made to reveal their preferences for defence by a market mechanism. Manpower and hardware for defence programmes can be costed in monetary terms but the benefits of national defence must be expressed in other terms, such as a cardinal or ordinal scale of military striking power. This example suggests that, for all practical purposes, the distinction between cost-benefit and cost-effectiveness analysis is that the former is concerned specifically with the *economic* benefits of projects, whereas the latter necessarily takes account of a variety of non-economic objectives. This means that in cost-benefit analysis we usually end up with a single decisive cost-benefit ratio or its equivalent. Cost-effectiveness analysis, however, may yield a number of criteria on different definitions of the objectives of a project. So, for example, if a defence project ranks high on the criterion of maximising damage to the enemy, but low on the criterion of minimising loss from attack, there is no way of deciding whether it is worthwhile without ranking these different objectives in order of their importance. In so doing, we are willy-nilly eliciting the decision-maker's "preference function", a problem that rarely arises in cost-benefit analysis, where it is frequently assumed that economic objectives are given first priority.

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(1) A similar distinction, expressed in different language, is drawn by R.A. Haveman: cost-benefit analysis is applicable to "public investments in which the efficiency content is of primary significance and efficiency impacts are measurable" and cost-effectiveness analysis is applicable to "equity-based public expenditures in which the efficiency content is insignificant and the efficiency impacts are largely nonmeasureable", "Benefit Cost Analysis. Its Relevance to Public Investment Decisions: Comment", *Quarterly Journal of Economics*, November, 1967, p. 696.

A moment's reflection will show that education falls uneasily between the two stools of cost-benefit analysis and cost-effectiveness analysis. On the other hand, insofar as there are private schools and colleges, there is a private as well as a public sector in education. Unfortunately, the existence of private education institutions does not help us very much in evaluating the output of public education, for the simple reason that most private schools and colleges are heavily subsidised by the State, either directly or indirectly, and hence provide their services at fees below unit costs. However, educational institutions, whether public or private, can be thought of as "selling" their output of services in a market, namely, the labour market, except that payments accrue to the owners of the services and not the producing units. In that sense, the case is analogous to that of a nationalised electricity industry that competes on equal terms with private electricity producers. Thus, the earnings of educated people can be used as "prices" with which to evaluate the output of the educational system - whether these "prices" correspond to the "value added" by education is another question.

On the other hand, the tendency of education to raise the productivity and hence the earning capacity of individuals is one and only one of the objectives of the educational process, and it can be argued that this vocational objective is of declining importance in advanced countries. If instead the goals of education are that of personal enrichment and the cultivation of potential talents - "intrinsic goals", the philosopher might call them - or that of fostering social cohesion by disseminating common values and/or that of equalising the life chances of different social classes - "extrinsic goals" - then expenditures on education can only be assessed by cost-effectiveness analysis: the social, cultural and political goals must somehow be quantified and the resulting numbers then become the required weights to apply to the output of the educational system.

Since education serves multiple goals, only one of which is that of preparing people for the "world of work", both cost-benefit analysis and cost-effectiveness analysis are appropriate techniques for evaluating educational projects. Indeed, in the final analysis all educational projects must be submitted both to cost-benefit analysis and to a variety of cost-effectiveness analyses, one for each separate quantifiable non-economic goal of education.

This conclusion is strengthened by considering the possibility that education is a "collective good". The benefits of a "collective good" are indiscriminate in the double sense that no consumer can be excluded from their enjoyment and that consumption by one person in no way reduces the consumption opportunities of others. Hence, collective goods cannot be priced by a market process because consumers have no incentive to reveal their preferences for these goods; what is required is a device like the ballot box to induce people to reveal their true preferences. Therefore, if education is a "collective good", we are not justified in conducting cost-benefit analysis of education, and must fall back on cost-effectiveness analysis as the only method of appraising educational projects(1).

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(1) This appears to be the argument of R.S. Eckaus, "Economic Criteria for Education and Training", Review of Economics and Statistics, May, 1964, pp. 181-3.

The concept of a "collective good", however, is more limited than appears at first glance. It is not enough to have joint consumption; we must also have equal consumption by all, whether paid for or not. Furthermore, there must be no rationing of supply because a limitation of quantities offered, accompanied by something like the issue of ration coupons, is equivalent to a price system. This leaves such phenomena as lighthouses, national defence, noise and smoke abatement, and immunisation against infections and contagious diseases as unambiguous examples of "collective goods", but not medical care in general, and not education as such. Education is not a pure "collective good" because the economic benefits of education are largely personal and, in that sense, perfectly discriminate. Furthermore, below the school leaving age, it is usually possible to buy "more education" in private schools, and above the school leaving age, the number of places in upper secondary and higher education are typically rationed in most countries in accordance with measured ability as revealed by examination results. It follows that neither of the two conditions of joint consumption and of equal consumption apply to the provision of educational services. Education could be privately financed and even privately provided, and, in so far as both the inputs and the output of the educational system are bought and sold in markets, the "prices" of teachers, students, and building do to some extent reflect the relative scarcities of resources involved in schooling.

It must be admitted, however, that it is not possible to confine all the economic benefits of education to those who have paid for it, nor is it possible to exclude the less educated from the social and cultural advantages of a society dominated by the more educated. Therefore, education, and for that matter, health, represents what might be called a "quasi-collective good", and to that extent cost-benefit analysis of education must be accompanied by cost-effectiveness criteria before launching into recommendations about educational policy.

So much then for definitions of cost-benefit and cost-effectiveness analyses. But what of "programme budgeting", or, as it is sometimes called, "performance budgeting" or "output budgeting"? In essence, programme budgeting is a method of recasting the accounts of a government department in such a way that the entire budget is distributed among a number of specific programmes, a "programme" being defined as an activity that has a unique objective(1). The purpose of such a budget format is to permit measurements of the success or failure of the various programmes in attaining stated objectives. Thus, "programme budgeting" leads by its very formulation to "performance budgeting" and the latter is indistinguishable from what we have called "cost-effectiveness analysis": "performance budgeting" is simply cost-effectiveness analysis confined to the broad functional objectives of the programmes that make up a departmental budget(2). A still more ambitious version of the same idea is the so-called

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(1) See Williams, op.cit., pp.10-11 for the outline of a programme budget for the British Home Office based on 1966/67 Civil Estimates. A number of American States now make use of programme budgets and three-quarters of American state colleges and universities employed some form of programme budget in 1967: F.E. Rourke, G.E. Brooks, The Managerial Revolution in Higher Education. Baltimore, Md.: The John Hopkins Press, 1966, p.69; and H. Williams, Planning for Effective Resource Allocation in Universities. Washington, D.C.: American Council on Education, 1966.

(2) For a comprehensive review of the subject, see D. Novick, ed., Program Budgeting. Cambridge, Mass.: Harvard University Press, 1965.

"planning-programming-budgeting system", announced by President Johnson in 1965, in which all essentially similar services administered by different government departments are grouped together to facilitate comparisons of costs and effectiveness in achieving objectives.

A still wider term, covering all sorts of cost-effective analysis, as well as cost-benefit analysis, is "systems analysis". Systems analysis has been defined as "the comparison of alternative means of carrying out some function, when those means are rather complicated and comprise a number of interrelated elements", and its applicability to individual school systems at the elementary and high school level has been vigourously defended(1). At the other end of the spectrum are such sub-optimising techniques as "operations research", of which "linear programming" or "activity analysis" is a special case, namely, the use of quantitative and frequently computable techniques for solving specific cost-minimisation problems: these have been applied in a number of countries to school-building problems and are potentially applicable to a wide variety of educational decisions, such as fitting existing staff and facilities to a given timetable, or allocating children from a given catchment area to a number of schools within the area, and so forth.

Enough has now been said to show that all of these tools boil down to two different sides of the same coin: maximising the returns, in some sense or other, from given amounts of resources devoted to education, or producing at the lowest possible cost whatever level of educational output may be chosen as the best one. We now leave the area of jargon(2), and review some efforts to apply cost-benefit and cost-effectiveness analyses to educational systems.

Cost-Benefit Analysis

Cost-benefit analysis of education generally takes the form of calculating an "internal rate of return" on investment in education, that is to say, discovering the discount rate which equates the present value of extra lifetime earnings attributable to a certain amount or type of additional education (after the legal school leaving age) with the present value of the costs of that extra education. It is an application of the "discounted cash-flow technique" to human capital formation and as such is sometimes referred to as "rate-of-return analysis" of educational investment. By "costs" are meant not only the out-of-pocket costs of students in the form of fees, books, and travel, as well as the costs of teachers, buildings, and equipment that students may not pay for, but also the earnings foregone by students from being at school rather than at work. When the costs are confined to out-of-pocket costs and earnings foregone, and when the earnings attributable to education are taken after tax, one speaks of "the private rate of return"; when all resources are taken into account and earnings are taken before tax, one speaks of "the social rate of return".

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(1) See J.A. Kershaw and R.N. McKean, Systems Analysis and Education. Research Memorandum RM - 2473 - FF. Santa Monica, Calif.: The Rand Corporation, 1959, pp. 1 ff.

(2) H.M. Treasury, Glossary of Management Techniques. London: H.M.S.O., 1967, is a useful guide through the terminological maze.

Rates of return on private and social investment in additional years of schooling have been calculated for the U.S.A., Great Britain, Israel, Mexico, Colombia, Chile, Venezuela, India and Uganda(1); almost no work has yet been done on applying the same technique to different types of education(2). Little need be said here about the limitations of this entire approach to educational investment planning: the question has already been fairly adequately canvassed elsewhere(3). Suffice it to say that the essence of rate-of-return analysis is the assumption that lifetime earnings differentials between individuals are close approximations to the differences in their contributions to national income, coupled with the empirical assertion that differences in earnings can be largely attributed to differences in educational attainments, rather than to differences in native ability and family background. Some critics deny the plausibility of the fundamental assumption - without, however, facing up to all the implications of this denial - and the statistical evidence about the influence of education as such on earnings is far from satisfactory. Furthermore, one of the prime objectives of cost-benefit analysis is to identify and measure the external economies and diseconomies that are so frequently generated by government activity: indeed, this is what distinguishes a cost-benefit appraisal of a project from a straight-forward calculation of its financial profitability. But little progress has so far been made in coming to grips with the external effects of education(4). In this sense, at any rate, cost-benefit analysis as applied to education has been somewhat disappointing.

At the same time it is worth pointing out that much confusion has been created in the field of educational planning by the suggestion that there are criteria other than cost-benefit analysis by which we can decide whether a given educational expenditure is a sound economic investment, such as the "social demand approach", the "international-comparisons approach" and the "manpower-requirements approach".

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(1) For a convenient summary, see W. Lee Hansen, ed., "Symposium on Rates of Return to Investment in Education", The Journal of Human Resources, Summer, 1967, pp. 291-374

(2) But see M. Blaug, P.R.G. Layard, and M. Woodhall, The Causes of Educated Unemployment in India. London: Oliver & Boyd, forthcoming, 1968, which calculates rates of return on individual degrees and on labour training as distinct from formal education. See also M. Blaug, "Literacy and Economic Development", The School Review, Winter, 1966, pp. 393-418, which formulates an approach to the calculation of the rate of return on investment in adult literacy campaigns in developing countries.

(3) See M. Blaug, "The Rate of Return on Investment in Education in Great Britain", The Manchester School, September, 1967, pp. 205-51.

(4) But see B.A. Weisbrod, External Benefits of Public Education: An Economic Analysis. Princeton, N.J.: Industrial Relations Section, 1964; G.S. Becker, Human Capital. A Theoretical and Empirical Analysis, with Special Reference to Education. Princeton, N.J.: Princeton University Press, 1964, pp. 119-21. See also Blaug, op.cit., pp. 234-40, and M. Blaug, "Economic Aspects of Vouchers for Education", Education. A Framework for Choice. London: Institute of Economic Affairs, 1967, pp. 27-32.

But there can be no economic justification for allocating more resources to education and less to some other activity unless this results in greater measurable economic benefits per unit of costs. Thus, if one takes the view that a government should adhere to certain norms of expenditures on education, in the form of a percentage of G.N.P. or of the public budget - the most popular variant of the social-demand approach - this is presumably because of a hunch that until these norms are reached, the returns to expenditure on education are higher than the returns to expenditure on other social services. Unfortunately, it is impossible to discover any foundation for this hunch other than the international equivalent of "keeping up with the Joneses", a foundation which is no firmer than the belief that other countries have somehow managed to optimally allocate resources to education so that all that remains for educational planning is to imitate them. Similarly, the manpower-requirements approach regards the economic benefits of education as a matter of overcoming crucial "bottlenecks" to economic growth in the form of scarce manpower with particular skill attributes. The costs of producing the highly-qualified manpower do not determine the outcome of a manpower forecast, apparently on the grounds that the economic returns in the form of realised growth are almost certain to exceed the costs of producing the manpower. Not only are costs of education largely ignored in the manpower-requirements approach, but so also are the wages and salaries of educated people. In fact, prices are simply left out of account altogether in this branch of educational planning and what we have instead are simply physical requirements for a certain structure of occupations, associated with corresponding physical requirements for a certain structure of educational attainments. All this makes good sense if there are, in fact, no substitutes whatever for particular skills and if these skills can be produced in schools in one and only one way. Unfortunately the approach itself provides no means of testing this strong assumption. At present, forecasts of manpower requirements cannot be made with any reliability beyond periods of three to five years - and even three-year forecasts have frequently proved inaccurate - and yet the time perspective of almost all manpower forecasts is as long as ten to fifteen years. In other words, the assumption of low substitutability between highly-qualified people has become a "faith" that is inherently non-falsifiable(1).

When we decide to spend another dollar on education rather than on health, or on one kind of education or another, we do so in the belief that, for the same cost, higher benefits can be obtained in one form rather than another. Since the costs are normally expressed in monetary terms and hence easily comparable, our decision implies that one kind of benefit is somehow larger than another. But "larger" suggests cardinal or at least ordinal measurement, and thus our decision to prefer A over B logically implies not only that the benefits of A and B can be measured, but that we have indeed somehow succeeded in measuring them. The oft encountered assertion that the benefits of education are so diverse and diffuse that they cannot be measured is either a semantic misunderstanding or pure obscurantism. Indeed, if it were true, educational decisions would be impossible. The real quarrel in the field of educational planning is about the nature of the benefits, about the success with which these have so far been measured, and about the weights that can be attached to benefits that are not all in the same dimension.

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(1) This is a summary of the argument of M. Blaug, "Approaches to Educational Planning", Economic Journal, June, 1967, pp. 263-85.

The failure to quantify the consumption value, the external effects, and all the other social and cultural contributions of education are characteristic of all current economic approaches to educational planning. On this score, there is nothing to choose between the social-demand approach, the manpower-requirements approach, and rate-of-return analysis. We simply do not know at present how to accurately measure benefits of education that are not directly reflected in the enhanced lifetime earnings of educated people, and all economists, whatever approach they have adopted towards educational planning, have been guilty of ignoring these indirect benefits. Nevertheless, rate-of-return analysis has the virtue of posing the issue sharply and thus opening the door to its successful resolution, whereas the other approaches virtually preclude consideration of the indirect benefits. The overwhelming advantage of rate-of-return analysis is precisely that it is cast in the mould of cost-benefit analysis and thus automatically encourages efforts to improve measurement of the benefits of education. It has the further virtue of linking up neatly with the social-demand approach to educational planning by permitting comparisons of the private rate of return that influences students and parents with the social rate of return that presumably influences governments(1). Lastly it appears to provide a convenient device for reforming salary structures in developing countries(2).

Cost-Effectiveness Analysis

To convey something of the flavour of cost-effectiveness analysis applied to education, I should like to summarise the results of a study that two of us have been conducting at the University of London Institute of Education on trends in total-factor-productivity in British higher and secondary education(3). By a trend in total-factor-productivity is meant a time series of output per unit of combined inputs, all variables being measured in terms of constant quality. Inputs were conventially defined to consist of 1) student time as measured by real earnings foregone by students, 2) teachers and administrative staff as measured by their real salaries, and 3) the services of buildings and equipment as measured by imputed rents and expenditures on materials. These measures were then combined into a weighted index of inputs, the weights being the relative contributions of each input to total direct and indirect outlays for that level of education. Output, on the other hand, was evaluated in terms of different concepts of educational effectiveness, such as 1) number of students completing a course; 2) number of students completing a course of standard length, longer courses being regarded as more output; 3) number of students completing a course of standard length in different subjects, some subjects being given higher weight than others; 4) number of students with given achievement test scores, higher increments of measured achievment being regarded as more output; and, lastly, 5) number of students with different future earning capacities as revealed by cross-section age-education-earning data, students with relatively higher earning potential being regarded as more output(1). Each definition of output yielded a different numerator for the ratio of output to inputs and, hence, a different total-factor-productivity index or, if you like, effectiveness-cost ratio. We labelled these different indices 1) "the unweighted index", 2) "the educational index", 3) "the cultural index", 4) "the academic index", and 5) "the economic index". Much to our surprise, all indices for both university and for secondary education moved in the same direction over the relevant periods, namely, downwards. In other words, it required more *identical* resources to produce a university student of *the same quality* in 1962 than in 1938, and to produce a secondary school leaver of *the same quality* in 1963 than in 1950. The fall in total-factor-productivity or effectiveness per unit of costs was significant in both cases: from 28 - 35 per cent over a 23-year period for universities, and from 25 - 35 per cent over a 12-year period for secondary schools.

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(1) See M. Blaug, "An Economic Interpretation of the Private Demand for Education", Economica, May, 1966, pp. 166-82.

(2) See M. Blaug, A Cost-Benefit Framework for Educational Planning in Developing Countries. Washington, D.C.: International Bank for Reconstruction and Development, forthcoming, 1968.

(3) M. Woodhall and M. Blaug, "Productivity Trends in British University Education, 1938-62", Minerva, Summer, 1965, pp. 483-98, with "Comments" by H.G. Johnson and R. Stone and a "Reply" by M. Woodhall and M. Blaug; also M. Woodhall and M. Blaug, "Productivity Trends in British Secondary Education, 1950-1963", Sociology of Education, Winter, 1968.

Cost-effectiveness analysis is usually applied to a variety of projects at one moment of time to determine which one is to be preferred at that moment. Here, however, we are looking at trends in the cost-effectiveness ratios of a single "project" to ascertain whether resources are being more or less effectively applied to that project as time passes. The striking implication of our central finding is that, from the point of view of assessing trends in "efficiency" in the sense just mentioned, it does not seem to matter whether education is valued in terms of "intrinsic" or in terms of "extrinsic" goals: the results are insensitive to a variety of weighting schemes for evaluating output. This conclusion cannot be reversed by appealing to the rising costs of staff or of equipment; as all the inputs are measured in units of constant purchasing power, total factor-productivity is *not* the reciprocal of money costs per student. Everyone knows that unit costs in British secondary and higher education have risen sharply in the last two or three decades. This rise has either been explained as inevitable - educational services, in which the scope for technical progress is necessarily limited, must compete with other more dynamic industries for staff, equipment, and buildings - or positively justified by the rising "quality" of the education provided. However, we have taken account of all the existing evidence about improvements in the quality of British education over the relevant years and in various ways converted these changes of quality into changes of quantity. It is true that the existing evidence about educational quality is far from satisfactory, and it can be argued that we have obtained our results simply because we failed to take account of quality factors that have so far defied measurement(2). But if this is so, it affects the standard justification of the rising costs of education as much as our measurement of productivity trends. The shoe is now on the other foot: what we have really established is not so much a set of numbers as a general presumption about long-term trends in productivity. Unless it can be shown that there are objectives of education that can be scaled which we have ignored, or that there are improvements of quality that can be quantified which we have failed to introduce into our argument, the presumption is that productivity or effectiveness per unit of costs in British secondary schools and universities has declined in the decade of the 1950's.

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(1) Note that in the case of universities, we measured only the output of teaching, because we despaired of any way of evaluating the output of research. This means that on the input side for universities, we included only the time of staff and the value of buildings and equipment devoted to teaching.

(2) For example, if university research has improved in quality over time and if, and it is a big if, teaching is indeed complementary with research, the quality of university teaching may have risen in a way that our figures do not allow for.

It is important to realise that our central purpose was to demonstrate a method of measuring productivity and to show that different measures do not necessarily yield conflicting answers. We limited ourselves to published data - the same data others have used to argue that rising unit costs imply improved quality - and there can be no doubt that we were severely limited by the paucity of relevant data in Great Britain compared to, say, the United States. For example, in appraising the effectiveness of university education over time, it is necessary to standardise the input of student time in terms of measured achievement: the quality of secondary education may have risen over the period and this effect must be allowed for in measuring the "value added" by universities. Ideally, therefore, one would like to compare scores on nation-wide educational attainment tests given to 18-year olds and again to 21-22 year olds. Unfortunately, Britain selects students for admission to universities from those who achieve Advanced-level passes in the General Certificate of Education, a series of subject tests administered by five different examining boards throughout the country, employing somewhat different standards; these standards have been rising over time but there is no independent evidence, such as the American "Project Talent", that allows one to accurately estimate the magnitude of this rise. Furthermore, British students, unlike American students, do not sit for a nationally administered Graduate Record Examination at the point of entry into post-graduate education. In other words, there really is no very firm evidence to estimate the "value added" by British universities in the form of improved achievements of students between the time of entry and that of graduation(1). This affects both the measurement of student time for all the different university productivity trends as well as the appraisal of cost-effectiveness of both secondary and university education, where effectiveness is defined in terms of the "intrinsic goals" of the educational system.

Similarly, we assumed that differences in the quality of individual teachers at any point in time correspond to differences in salaries, which in Britain are a function of only two variables: the educational qualifications of teachers and the length of their experience. In this way, we attempted to measure the input of teacher time in units of constant quality. All this ignored the much-discussed question of teacher effectiveness as a function of class size. It is worth pointing out that we treated a reduction in the pupil-teacher ratio as a decline in productivity unless there was unambiguous quantitative evidence that smaller classes raised the quality of education. This flies in the face of the educational dogma that smaller classes always improve quality. The whole point of the exercise, however, was to demonstrate, firstly, that even if this were true, the increased quality of smaller classes must be weighed against their higher costs, and, secondly, that the existing evidence does not support the thesis that the smallest class is the best class. It seems clear that if the qualify of education (as measured by pupil achievement in attainment tests) really is a function of class size - and past studies throw doubt even on this proposition - the functional relationship is not a monotonic one but a discontinuous step-function with more than one maxima and minima varying with the nature of the subject, the type of teaching method, and the age and ability of students. Once again, we would have liked to introduce class size explicitly into the measurement of inputs and output, but had to abandon the effort in the absence of any reliable data on the effects of different pupil-teacher ratios. The most we could claim for our results is that it might provoke re-examination of the complacent belief in educational circles that the pupil-teacher ratio is a perfect proxy of educational quality.

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(1) To a lesser extent, the same observation applies to British secondary schools: a plausible explanation of falling productivity in secondary schools is the declining ability of the average student, as more and more students stay on after the age of 15. It may take more intensive and more skilled teaching to bring these students up to given standards. However, there is very little evidence that this has, in fact, happened.

Lastly, even if one believes that education should be appraised in narrow economic terms, there is no census data in Britain on the age-specific earnings of people with various educational qualifications. The evidence that we used derives from special sample surveys and did not distinguish between students in various fields of specialisation. Furthermore, it is conceivable that education makes a contribution to economic performance, not simply by raising the earning capacity of people, but also by promoting inter-occupational, inter-industrial, and inter-regional mobility. What is required is data on labour mobility cross-classified by educational attainments, data that do not exist in Britain, or for that matter in most other European countries.

There are widely-held objectives of education, such as equalisation of educational opportunities, that we ignored, not because they cannot be turned into quantitative weights to apply to output, but simply because the existing data proved to be unsuitable. Thus, one might define the goal of equalising educational opportunities as that of increasing the proportion of children of manual working class fathers who participate in upper secondary and higher education. Unfortunately, this proportion has not changed at all since 1938 in universities; there is no national data that reveals this changing proportion in secondary schools since 1950. It is not difficult to specify the data that would be needed to appraise the effectiveness with which schools have been improving the "life chances" of working class children. But this data does not exist in Great Britain.

One could continue almost indefinitely in this vein, illustrating the sort of evidence one needs to measure the productivity of effectiveness of education that may or may not be available. The point is that the very framework of cost-benefit and cost-effectiveness analysis directs one's attention to critical gaps in data; and that is the chief merit of the framework.

According to Popper, scientific propositions are distinguished from metaphysical ones by the property of falsifiability. Scientific propositions are not only falsifiable but invite falsification as the hallmark of scientific progress. The finding that the productivity of British secondary schools and universities has fallen in recent years, on various alternative definitions of output, constitutes a challenge to educational psychologists and sociologists: we would love to be proved wrong! The only rule we lay down for those who will rise to the challenge is that of sticking to quantifiable variables. We do not say that only that which is measurable is significant, but simply that whatever cannot be expressed in terms of "more or less" cannot be used to reach decisions about alternative courses of action.

ANALYSES COUT-BÉNÉFICE ET COUT-EFFICACITÉ APPLIQUÉES A L'ENSEIGNEMENT

par Mark Blaug

Introduction

Parmi toutes les techniques d'évaluation des projets d'investissement que l'on applique depuis quelques années au secteur public, aucune n'a davantage retenu l'attention que l'analyse coût-bénéfice. Bien que les concepts sur lesquels elle repose soient connus des économistes depuis la fin du siècle dernier, elle n'a vraiment pris forme qu'au cours des années 50, à la suite des tentatives faites aux Etats-Unis pour rationaliser l'aménagement des grands bassins fluviaux. Depuis lors, cette technique a été appliquée à presque toutes les industries du secteur public, à la défense nationale, à la santé publique, à la construction de logements, aux réseaux de transports, à l'aménagement du territoire et à l'urbanisme, au développement régional, et bien entendu à l'enseignement aussi bien aux Etats-Unis qu'au Royaume-Uni, comme en fait dans la plupart des pays qu'ils soient développés ou non (1). L'emploi grandissant de cette technique s'est toutefois accompagné d'un certain foisonnement sémantique et de nombreux profanes se demandent toujours à l'heure actuelle quelle différence il y a entre des expressions comme "analyse coût-bénéfice", "analyse coût-efficacité" et "techniques d'actualisation des dépenses et des recettes", sans parler des concepts apparentés comme ceux de "budget par programme", de "budget d'exécution", d'"analyse de systèmes", de "recherche opérationnelle" et de "programmation linéaire". C'est pourquoi il est utile, en guise d'introduction à notre débat, de cerner le sens de ces différentes expressions. Je commencerai donc par quelques définitions.

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(1) Une bonne vue d'ensemble de la question, notamment une abondante bibliographie de 90 titres est donnée dans l'article de A.R. Prest et R. Turvey "Cost-Benefit Analysis : A Survey", Economic Journal, décembre 1965, reproduit dans Surveys of Economic Theory, volume III, Resource Allocation, Londres : Macmillan, 1966 ; d'utiles compléments sont fournis par G.H. Peter, Cost-Benefit Analysis and Public Expenditures, Eaton Papers 8, Londres : The Institute of Economic Affairs, 1966, et par A. Williams, Output Budgeting and the Contribution of Micro-Economics to Efficiency in Government, CAS Occasional Papers 4, Londres : H.M.S.O., 1967

Définition des expressions

En un sens, le but de l'analyse coût-bénéfice est de faire explicitement ce que le mécanisme des prix accomplit implicitement. Dans une économie de marché régie par la concurrence, les efforts faits par les entrepreneurs pour minimiser les coûts et maximiser le rendement des capitaux investis sont générateurs d'un système de prix qui traduisent à la fois les coûts d'opportunité des différents biens et services - lesquels sont fonction de l'emploi le plus profitable auquel auraient pu être affectées les ressources consacrées à la production des biens et services en question - et les sacrifices que le consommateur est prêt à consentir pour se les procurer ; les prix ne sont que les "poids" que l'ensemble des participants au marché assignent aux coûts et aux profits des activités en question. Par opposition, il existe dans chaque pays toute une série de services que le secteur public fournit normalement sans en faire payer le prix ; même si les services publics achètent les facteurs de production sur le marché, la production n'est pas commercialisée ; mais il est fort possible en outre que les services en question ne soient fournis sous aucune forme par le secteur privé ; l'exemple des autoroutes est typique à cet égard. Dans tous les cas de cette nature, il n'existe pas de prix en fonction desquels on puisse évaluer les avantages procurés. D'ailleurs, même lorsque le secteur privé fournit des services de même genre - comme c'est le cas pour la médecine privée dans les pays qui possèdent un Service National de Santé - les prix résultant du mécanisme des marchés peuvent rarement servir de coefficients de pondération pour évaluer la production du secteur public, pour la raison simple qu'au départ l'intervention gouvernementale dans le secteur considéré a généralement été une réaction contre un "défaut de marché".

Par "défaut de marché" il faut entendre tout ce qui conduit à une répartition inefficace des ressources en régime de concurrence parfaite ; plus exactement, quelle que soit au départ la répartition des revenus, et à supposer même que les producteurs maximent leurs profits et les consommateurs leur satisfaction, possèdent une connaissance parfaite des résultats certains de toutes les décisions possibles, l'existence soit

(1) d'économies d'échelle, soit

(2) d'effets externes sur la production ou la consommation, soit

(3) de "biens collectifs",

entraîne une divergence entre les bénéfices privés et les bénéfices publics. Il en résulte qu'une intervention dans le mécanisme du marché est capable d'améliorer la satisfaction d'au moins un individu sans diminuer celle des autres - ce qui est très exactement la définition économique de la "répartition inefficace des ressources" (1).

A l'époque actuelle, l'expansion du secteur public peut souvent s'interpréter comme une réaction à l'une ou plusieurs de ces trois grandes causes de carence du marché. De toute évidence, si le but d'un Service National de Santé est de corriger une insuffisance des investissements dans le domaine de la santé publique, résultant de l'existence d'une médecine privée, il serait erroné d'évaluer les avantages procurés par des hôpitaux publics en fonction des prix pratiqués par les cliniques privées : ces prix ne reflètant pas les avantages externes procurés par les réalisations du secteur public, lesquelles sont la raison d'être d'un Service National de Santé. Autrement dit, dans presque tous les cas où l'on peut évaluer la production du secteur public en utilisant les prix pratiqués par une activité privée comparable, ces prix ne sont pas les coefficients de pondération que nous recherchons; dans les autres cas, il n'existe tout simplement pas de prix issus du marché dont nous puissionsnous servir. Néanmoins, si nous devons préférer une branche d'activité publique à une autre, ou choisir une activité du secteur public plutôt que du secteur privé, il nous faut trouver un moyen de comparer leurs coûts et leurs avantages respectifs, et cela n'est possible en toute logique que s'ils sont exprimés en fonction d'un dénominateur commun. Etant donné l'hétérogénéité physique des coûts et des avantages, un dénominateur commun satisfaisant sera presque toujours une somme d'argent. En bref, nous pouvons difficilement nous passer des prix pour évaluer les coûts et les avantages des activités du secteur public, et pourtant nous ne pouvons pas utiliser simplement ceux du monde réel. C'est bien là le "pont aux ânes" de l'analyse coût-bénéfice.

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(1) Nous pouvons ajouter à l'intention des profanes que toutes les définitions de la "répartition efficace des ressources" se réduisent en fin de compte à l'idée que toutes les ressources doivent avoir une productivité égale dans tous les emplois qu'elles sont susceptibles de recevoir. Si des économies d'échelle sont possibles dans une branche, cette condition n'est pas respectée, car avec une quantité de ressources donnée on pourrait accroître la production en transférant une partie de ces ressources à la branche en question. De la même façon, si certaines activités sont génératrices d'avantages (ou de coûts) externes dont on ne saurait faire payer le prix faute de pouvoir les imputer à des agents économiques déterminés, le bien-être de chacun serait accru si l'on développait (ou restreignait) ces activités. Enfin, lorsqu'il existe des biens dont l'utilisation procure un ensemble d'avantages réellement indivisible - autrement dit des biens dont l'abondance accrue pour un individu, s'accompagne d'une abondance également croissante et non moindre pour les autres - chacun cherche à éviter d'en payer le prix, en considérant qu'il les obtiendra de toute façon ; il est tout simplement impossible que le prix de ces "biens collectifs" se forme sur le marché et ce n'est que l'usage du bulletin de vote qui peut décider s'ils doivent être fournis ou non. (Ces considérations seront développées plus loin).

Nous définirons maintenant "l'analyse coût-bénéfice" comme une technique applicable à l'évaluation des projets d'investissements publics lorsque ceux-ci entrent, du moins partiellement, en concurrence avec des projets similaires réalisés par le secteur privé. En pareil cas, en effet, le mécanisme du marché engendre des prix dont on peut se servir pour traduire les avantages du projet considéré en des termes directement comparables à ceux qu'on utilise pour exprimer ses coûts. Certes, ces prix devront être ajustés pour tenir compte de l'action d'une ou de plusieurs causes de "défaut du marché" - d'où la référence classique à des "prix duaux" - mais du moins nous donnent-ils un point de départ. D'autre part "l'analyse coût-efficacité" est définie comme une technique applicable à l'évaluation des projets d'investissements publics qui présentent un caractère spécifique ; pour les activités de cette nature il est impossible d'exprimer la production en termes monétaires, parce qu'il n'existe pas de marché sur lequel un prix lui soit attribué (1). Un exemple souvent invoqué est celui de la défense nationale : non pas tant parce qu'on achète ni ne vend de programmes militaires, mais surtout parce que, la défense nationale étant un "bien collectif", il serait impossible d'obtenir que les consommateurs révèlent par des transactions commerciales leurs préférences pour cette forme de sécurité. La main-d'oeuvre et les biens de production nécessaires à la réalisation des programmes militaires peuvent être évalués en termes monétaires, mais les avantages de la défense nationale doivent être exprimés en des termes différents, au moyen, par exemple, d'une échelle de mesure cardinale ou ordinale de la puissance de frappe qu'elle assure. Cet exemple montre que, dans la pratique, l'analyse coût-bénéfice se distingue de l'analyse coût-efficacité en ce sens qu'elle tient uniquement compte des avantages économiques des projets, tandis que la seconde forme d'analyse prend nécessairement en considération des objectifs extra-économiques très divers. C'est dire qu'au terme de l'analyse coût-bénéfice on aboutit normalement à établir entre ces deux éléments un ratio unique et décisif, ou un paramètre équivalent. Par contre, l'analyse coût-efficacité peut permettre de dégager plusieurs critères de choix suivant la manière dont on définit les objectifs du projet considéré. Ainsi, par exemple, si un projet militaire se classe différemment selon qu'on se propose de maximer les dommages pouvant être infligés à l'ennemi, ou de minimer les pertes à redouter d'une attaque, il n'y a aucun moyen de décider si le projet mérite d'être retenu, à moins d'avoir préalablement classé ces deux objectifs par ordre d'importance ; et pour établir ce classement, il faut, qu'on le veuille ou non, tirer au clair la "fonction de préférence" du responsable de la décision, problème qui se pose rarement dans une analyse coût-bénéfice, où l'on admet généralement que les objectifs économiques ont priorité absolue.

Un instant de réflexion permet de voir que l'enseignement occupe une position incommode entre les deux domaines de l'analyse coût-bénéfice et de l'analyse coût-efficacité. D'autre part, dans la mesure où il existe des écoles et des universités privées, l'enseignement appartient aussi bien au secteur public qu'au secteur privé. Malheureusement, l'existence d'établissements scolaires privés ne nous aide guère à évaluer le produit de l'enseignement public, pour la simple raison que la plupart des écoles et universités privées sont fortement subventionnées par l'Etat, sous des formes directes ou indirectes, ce qui leur permet de fournir leurs services contre paiement de droits de scolarité inférieurs au prix de revient unitaire. On peut toutefois considérer que les établissements d'enseignement, qu'ils soient publics ou privés, "vendent" leurs services sur un marché, en l'espèce celui du travail, avec cette différence que les paiements sont encaissés par les bénéficiaires des services en question et non par les entités qui produisent lesdits services. En ce sens, le cas de l'enseignement est analogue à celui d'une industrie nationalisée de l'électricité qui lutte à armes égales avec les producteurs de courant privés. Les gains des personnes instruites peuvent être utilisés comme des "prix" pour évaluer la production du système éducatif (quant à savoir si ces "prix" correspondent à la "valeur ajoutée" par l'instruction, c'est une autre question).

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(1) Une distinction semblable est exprimée par R.A. Haveman dans "Benefit Cost Analysis. Its relevance to Public Investment Decisions : Comment", Quarterly Journal of Economics, novembre 1967, page 696.

D'autre part, la tendance de l'enseignement à élever la productivité, donc la capacité de gain des individus, n'est que l'un des objectifs du processus éducatif ; on peut même prétendre que cet objectif professionnel perd graduellement de son importance dans les pays développés. Si par contre, les buts de l'enseignement sont d'enrichir la personnalité des individus et de développer les aptitudes potentielles - ce qu'un philosophe pourrait appeler "buts intrinsèques" - ou de favoriser la cohésion sociale en répandant des valeurs communes et/ou d'assurer aux différentes classes de la société des chances égales de succès dans la vie ("buts extrinsèques"), on se trouve alors dans l'impossibilité d'apprécier l'utilité des dépenses d'enseignement autrement que par une analyse coût-efficacité : les objectifs sociaux, culturels et politiques doivent être quantifiés d'une manière ou d'une autre et les valeurs numériques qui leur sont assignées deviennent alors les coefficients de pondération à appliquer à la production du système d'enseignement.

Puisque l'enseignement vise des objectifs multiples, dont l'un seulement consiste à préparer les individus à la "vie professionnelle", l'analyse coût-bénéfice et l'analyse coût-efficacité doivent l'une et l'autre être utilisées pour l'évaluation des projets relatifs à l'enseignement. En fait, tout projet de cette nature doit finalement être soumis à la fois à l'analyse coût-bénéfice et à diverses analyses coût-efficacité, portant tour à tour sur chacun des objectifs extra-économiques de l'enseignement pourvu qu'il soit quantifiable.

Cette conclusion se trouve renforcée si l'on envisage la possibilité que l'enseignement soit un "bien collectif". Les avantages d'un "bien collectif" sont doublement indivisibles, en ce sens qu'aucun consommateur ne peut se les voir refuser et que la consommation de ce bien par un individu quelconque ne diminue en rien les possibilités de consommation des autres. Les biens collectifs ne peuvent donc donner lieu à la formation de prix sur un marché, car les consommateurs ne sont pas incités à révéler leurs préférences à leur égard ; il faut une procédure de vote pour les pousser à faire connaître leurs véritables préférences. Par conséquent, si l'enseignement est un "bien collectif" nous ne sommes pas justifiés à soumettre cette activité à l'analyse coût-bénéfice, et nous devons à nouveau faire appel à l'analyse coût-efficacité comme à la seule méthode qui permette d'évaluer les projets relatifs à l'enseignement (1).

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(1) Tel semble être le raisonnement de R.S. Eckaus dans "Economic Criteria for Education and Training", Review of Economics and Statistics, mai 1964, pp. 181-183.

La notion de "bien collectif" est toutefois plus limitée qu'il n'apparaît à première vue. Il ne suffit pas que le bien considéré soit consommé en commun, il faut encore qu'il le soit également par tous les membres de la société, qu'ils paient ou non pour cela. En outre il ne faut pas que l'offre soit restreinte, car une limite quantitative, accompagnée par exemple de la délivrance de cartes de rationnement, équivaut à un système de prix. Il reste donc, comme exemple typique de "bien collectif", la signalisation des côtes, la défense nationale, la luttre contre le bruit et la pollution et l'immunisation contre les maladies contagieuses, mais non pas les soins médicaux en général, ni l'éducation comme telle. L'éducation n'est pas un véritable "bien collectif", car les avantages économiques qu'elle procure sont en grande partie personnels, et en ce sens, elle est parfaitement discriminatoire. En outre, avant l'âge limite de la scolarité obligatoire, il est généralement possible d'acquérir "davantage d'instruction" dans les écoles privées payantes, et au-delà de cet âge le nombre des places offertes par les établissements de l'enseignement secondaire du deuxième cycle et de l'enseignement supérieur est restreint dans la plupart des pays en fonction des aptitudes individuelles révélées par les résultats obtenus aux examens. Il s'ensuit que la fourniture des services éducatifs ne satisfait ni à l'une ni à l'autre des deux conditions sus-mentionnées : consommation en commun et consommation égale. L'enseignement pourrait être financé, et même assuré, en totalité par le secteur privé et, dans la mesure où les moyens ou la production du système éducatif sont achetés et vendus sur des marchés, les "prix" des professeurs, des étudiants et des bâtiments traduisent jusqu'à un certain point la rareté relative des ressources absorbées par les activités scolaires.

Il faut toutefois admettre qu'il n'est pas possible de restreindre l'ensemble des avantages économiques de l'enseignement aux individus qui ont payé pour faire des études ; pas plus qu'il n'est possible de refuser aux individus peu instruits les avantages sociaux et culturels qu'offre une société dominée par les plus instruits. L'enseignement de même que la santé publique constitue donc ce que l'on pourrait appeler un "bien collectif" ; c'est pourquoi l'analyse coût-bénéfice doit s'accompagner de critères de rendement avant de prétendre aboutir à des recommandations au sujet de la politique scolaire.

Voilà donc pour les définitions de l'analyse coût-bénéfice et de l'analyse coût-efficacité. Mais qu'en est-il du "budget fonctionnel par programme", ou comme on l'appelle quelquefois "budget de résultats" ou "budget de production". En substance, établir un budget par programme consiste à redistribuer les comptes d'un Ministère de sorte que la totalité du budget soit répartie entre un certain nombre de programmes déterminés, un "programme" désignant une activité à objectif unique (1). Le but de cette présentation budgétaire est de permettre de mesurer les succès ou les échecs enregistrés par rapport aux objectifs préalablement définis des divers programmes. Un "budget par programme" conduit donc, de par son mode d'établissement, à dresser un "budget résultats", lequel ne se distingue en rien de ce que nous avons appelé une "analyse coût-efficacité" : un "budget de résultats" est simplement une analyse coût-efficacité limitée aux grands objectifs fonctionnels des programmes qui forment le budget d'un Ministère (1). Une variante encore plus ambitieuse de la même idée est le système dit de "budget fonctionnel par plan et programmes" dont le Président Johnson a annoncé l'adoption en 1965 et dans lequel toutes les tâches fondamentalement similaires assumées par les différents ministères sont regroupées afin de faciliter les comparaisons entre les coûts de réalisation des objectifs et l'efficacité obtenue ou escomptée.

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(1) Voir Williams, op. cit., pages 10-11, pour une esquisse de budget fonctionnel par programme pour le Ministère de l'Intérieur britannique, à partir des Prévisions des Dépenses Civiles pour l'exercice 1966/67. Plusieurs Etats américains recourent actuellement à l'établissement de budgets par programme et en 1967 les trois quarts des grandes écoles et universités des Etats-Unis ont employé cette méthode sous une forme ou une autre ; F.E. Rourke, G.E. Brooks, The Managerial Revolution in Higher Education. Baltimore, Md. : The John Hopkins Press, 1966, p. 69, et H. Willimans, Planning for Effective Resource Allocation in Universities, Washington D.C. American Council on Education, 1966.

Une notion encore plus large, recouvrant toute sorte d'analyses coût-efficacité, aussi bien que d'analyses coût-bénéfice, est l'"analyse des systèmes". Elle a été définie comme la "comparaison des différents moyens d'accomplir une tâche, lorsque ces moyens sont assez complexes et comportent un certain nombre d'éléments interdépendants", et la possibilité de l'appliquer aux systèmes scolaires aux niveaux primaire et secondaire a été vigoureusement défendue (2). A l'autre extrémité de la gamme se trouvent des techniques de sous-optimisation comme la "recherche opérationnelle", dont la "programmation linéaire" ou l'"analyse d'activité" est une forme particulière et qui revient à l'utilisation de techniques quantitatives pour résoudre des problèmes particuliers de minimisation des coûts. Ces méthodes ont été appliquées dans plusieurs pays à des problèmes de construction scolaire et on pourrait de même s'en servir pour toute sorte de décisions intéressant l'enseignement, qu'il s'agisse d'utiliser au mieux le personnel enseignant et les locaux en fonction d'un horaire donné, ou de répartir au mieux les élèves d'une zone donnée entre les différents établissements scolaires de cette zone, etc.

Nous en avons suffisamment dit sur ce sujet pour montrer que l'emploi de tous ces instruments répond aux deux aspects d'une même préoccupation : maximer le rendement (quelque sens qu'on donne à ce mot) tiré de l'affectation d'un volume donné de ressources, minimer le coût de la production du système éducatif, quel que soit le niveau optimal qu'on lui assigne. Nous laissons à présent de domaine du jargon (3) et passons à l'étude de quelques tentatives d'application aux systèmes éducatifs de l'analyse coût-bénéfice et de l'analyse coût-efficacité.

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(1) Pour un exposé général de la méthode, voir D. Novick ed. Program Budgeting. Cambridge, Mass : Harvard University Press, 1965.

(2) Voir J.A. Kershaw et R.N. McKean, Systems Analysis and Education. Research Memorandum RM - 2473 - FF. Santa Monica, Calif. : The Rand Corporation, 1959, pp. 1ff.

(3) H.M. Treasury, Glossary of Management Techniques, London : H.M.S.O., 1967.

Analyse coût-bénéfice

L'analyse coût-bénéfice des projets éducatifs consiste généralement à calculer le "taux de rentabilité interne" des sommes investies dans l'éducation, autrement dit, à déterminer le taux d'actualisation qui permet d'égaler la valeur actuelle du supplément des gains qu'obtiendra durant son existence un individu ayant reçu un supplément d'instruction d'une certaine durée ou d'un certain type (au-delà de la limite d'âge de scolarité obligatoire), à la valeur actuelle des coûts de ce supplément d'instruction. Cette méthode est une application de la "technique d'actualisation des recettes et des dépenses" à la formation du capital humain, c'est pourquoi elle est souvent appelée "analyse du taux de rendement" des investissements dans l'enseignement. Par "coûts" on entend non seulement les dépenses financées par les étudiants eux-mêmes sous forme de droits de scolarité, de livres et de voyages, ainsi que le coût des professeurs, des bâtiments et du matériel qui n'est pas nécessairement supporté par les étudiants, mais aussi les gains auxquels les étudiants ont renoncé en poursuivant leurs études au lieu de prendre un emploi rémunéré. Si par "coût", on n'entend que les dépenses et le manque à gagner des étudiants, et si on défalque les impôts des gains imputables à l'instruction reçue, on parle de "taux de rentabilité privé", si l'on fait entrer en ligne de compte toutes les ressources affectées à l'enseignement, et si l'on considère les gains avant déduction des impôts, on parle alors de "taux de rentabilité social".

Les taux de rendement privé et social de l'investissement que constitute un supplément de scolarité ont été calculés pour les Etats-Unis, la Grande-Bretagne, Israël, le Mexique, la Colombie, le Chili, le Venezuela, l'Inde et l'Ouganda (1) ; mais presque rien n'a encore été fait en vue d'appliquer cette technique aux différents types d'instruction (2). Il n'est pas nécessaire de s'étendre ici sur les insuffisances que présente cette méthode d'évaluation des projets d'investissement dans l'enseignement, car la question a déjà été suffisamment traitée ailleurs (3). Il suffira de rappeler que l'analyse du taux de rendement est fondée sur l'*hypothèse* que les écarts entre les gains cumulés par les individus au cours de leur vie correspondent approximativement aux différences entre leurs contributions respectives au revenu national, et sur l'assertion empirique que les écarts entre les gains individuels peuvent être attribués en grande partie aux différences de niveau d'instruction plutôt qu'à des différences d'aptitudes innées et de milieu familial. Certains auteurs jugent l'hypothèse de base peu plausible - sans toutefois envisager tout ce que cette contestation implique - d'autre part les preuves statistiques de l'influence propre de l'instruction sur les gains sont loin d'être satisfaisantes. En outre, l'un des principaux objectifs de l'analyse coût-bénéfice est d'isoler et de mesurer les économies et les déséconomies externes qui sont si souvent engendrées par les activités de l'Etat : c'est là en fait ce qui distingue une évaluation des coûts et des avantages d'un projet du calcul de rentabilité financière pure et simple. Toutefois on n'est guère parvenu jusqu'à présent à cerner les effets externes de l'enseignement (1). En ce sens en tout cas, l'application à l'enseignement de l'analyse coût-bénéfice a été quelque peu décevante.

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(1) Pour un résumé pratique de la question, voir W. Lee Hansen, ed., "Symposium on Rates of Return to Investment in Education", *The Journal of Human Resources*, été 1967, pp. 291-374.

(2) On peut toutefois se reporter à l'ouvrage de M. Blaug, P.R.G. Layard, et M. Woodhall, *the Causes of Education Unemployment in India*. Londres : Oliver & Boyd, à paraître en 1968, qui calcule le taux de rendement pour divers diplômés et pour la formation professionnelle par opposition à l'enseignement ; on peut aussi se référer à l'article du même auteur "Literacy and Economic Development" *The School Review*, hiver 1966, pp. 393-418, qui donne une méthode pour calculer le taux de rendement du capital investi dans les campagnes entreprises dans les pays en voie de développement en faveur de l'instruction des adultes.

(3) Voir l'article de M. Blaug, "The Rate of Return on Investment in Education in Great Britain", paru dans *The Manchester School*, septembre 1967, pp. 205-251.

D'un autre côté, il faut bien le dire, une grande confusion a été créée dans le domaine de la planification de l'enseignement par l'idée qu'il existe d'autres méthodes que l'analyse coût-bénéfice pour décider si une dépense donnée d'enseignement serait un investissement économique judicieux ; notamment "la méthode de la demande sociale", la "méthode des comparaisons internationales" et "l'optique des besoins en main-d'oeuvre". Or il n'y a pas de raison d'ordre économique d'affecter plus de ressources à l'enseignement au détriment d'une autre activité, si les avantages économiques mesurables que cela procure ne sont pas plus importants par unité de coût. Si, par exemple, on admet qu'un gouvernement doit adopter certaines normes en matière de dépenses d'enseignement, en affectant à celui-ci un pourcentage déterminé du P.N.B. ou du budget de l'Etat (comme le préconisent le plus souvent les partisans de la méthode de la demande sociale),c'est vraisemblablement sous l'effet d'une sorte de pressentiment que tant que ces normes ne sont pas atteintes le rendement des dépenses supplémentaires qui pourraient être consacrées à l'enseignement serait supérieur à celui de l'affectation des mêmes sommes à d'autres services sociaux. Malheureusement, il est impossible de discerner sur quoi ce pressentiment repose, si ce n'est sur la conviction qu'un pays doit faire comme ses voisins. Ce qui revient à croire, sans plus de raison, que les autres pays ont réussi d'une façon quelconque à affecter un volume optimal de ressources à leur enseignement et qu'il n'y a plus qu'à les imiter. De la même façon, dans l'optique des besoins en main-d'oeuvre, l'enseignement est considéré comme économiquement rentable dans la mesure où il résoud le problème de certaines catégories de personnel qualifié et qui freinent l'expansion économique. Or, le coût de la formation du personnel hautement qualifié n'intervient pas dans l'établissement des prévisions des besoins de main-d'oeuvre, apparemment parce qu'on estime que la contribution de ce personnel à l'expansion économique serait presque certainement supérieure au coût de sa formation. D'autre part, dans l'optique des besoins en main-d'oeuvre on néglige en grande partie non seulement le coût de l'enseignement, mais aussi les rémunérations qui seront versées aux gens instruits. En réalité, les adeptes de cette méthode de planification de l'enseignement laissent totalement de côté la question des prix et se bornent à déterminer les besoins matériels à satisfaire pour obtenir une certaine structure professionnelle, ainsi que les besoins matériels correspondants auxquels on devra faire face pour obtenir une certaine répartition de la population active par niveau d'instruction. Tout cela serait raisonnable s'il n'existait, en fait, aucune possibilité de substitution entre individus ayant des compétences professionnelles différentes et s'il n'existait qu'une seule manière d'acquérir ces qualifications à l'école. Malheureusement la méthode elle-même ne fournit aucun moyen de vérifier cette hypothèse assez extrême. A l'heure actuelle, les prévisions des besoins en main-d'oeuvre ne peuvent être établies avec quelque certitude pour des périodes de plus de trois à cinq ans (il est même fréquemment arrivé que des prévisions à trois ans d'échéance se révèlent inexactes) et pourtant presque toutes les prévisions concernant la main-d'oeuvre portent sur des périodes de 10 à 15 ans. Autrement dit, l'hypothèse selon laquelle les spécialistes sont difficilement substituables les uns aux autres est devenu un "article de foi" dont la validité est invérifiable par essence (1).

Si nous décidons d'affecter un dollar de plus à l'enseignement plutôt qu'à la santé publique, ou à un type d'instruction de préférence à un autre, c'est parce que nous croyons, que pour la même dépense, on peut obtenir des avantages plus importants dans un cas que dans l'autre. Comme les coûts sont normalement exprimés en termes monétaires et, par conséquent, facilement comparables, on présuppose que les avantages à attendre d'un type de dépenses sont d'une certaine manière supérieurs. Mais cette "supériorité" sous-entend l'emploi d'une échelle de mesure cardinale ou du moins ordinale, et notre décision de préférer A à B implique donc, en bonne logique, non seulement que les avantages respectifs de A et de B peuvent être mesurés, mais aussi que l'on a déjà réussi d'une manière ou d'une autre à les mesurer effectivement. L'affirmation courante selon laquelle on ne peut mesurer les avantages de l'instruction en raison de leur diversité et de leur caractère diffus recouvre soit un malentendu sémantique, soit une pure manifestation d'obscurantisme. En fait, si cette affirmation était vraie, il serait impossible de prendre des décisions en matière d'enseignement. La véritable controverse dans le domaine de la planification de l'enseignement porte sur la nature des avantages de l'instruction, sur le succès avec lequel ils ont été mesurés jusqu'à présent, et sur les coefficients de pondération qu'on peut assigner à des avantages qui ne sont pas tous du même ordre.

L'échec des tentatives faites pour chiffrer la valeur de l'instruction comme un bien de consommation, ainsi que ses effets externes et tous les autres avantages sociaux et culturels qu'elle procure, caractérise toutes les méthodes économiques appliquées actuellement à la planification de l'enseignement. De ce point de vue, il n'y a aucune raison de préférer la méthode de la demande sociale à celle des besoins en main-d'oeuvre, ou à l'analyse du taux de rendement. Nous sommes tout simplement incapables à l'heure actuelle de mesurer de façon exacte les avantages de l'instruction qui ne se traduisent pas directement par des suppléments de gain perçus par les gens instruits au cours de leur vie, et tous les économistes, de quelque façon qu'ils aient abordé la planification de l'enseignement, ont commis l'erreur de négliger ces avantages indirects. Néanmoins, l'analyse du taux de rendement a l'avantage de poser le problème de façon plus nette, et d'ouvrir ainsi la voie à sa solution, alors que les autres méthodes excluent pratiquement la possibilité de tenir compte des avantages indirects. L'analyse du taux de rendement présente l'avantage décisif d'être conçue sur le modèle de l'analyse coût-bénéfice, donc d'encourager automatiquement des efforts à trouver une meilleure mesure des avantages de l'instruction. Elle a en outre le mérite de pouvoir se raccorder assez bien à l'étude de la planification de l'enseignement dans l'optique de la demande sociale en permettant des comparaisons entre le taux de rendement privé qui influence le choix des étudiants et des parents et le taux de rendement social en fonction duquel les gouvernements sont supposés agir (1). Enfin, cette forme d'analyse semble fournir un moyen commode de réformer la structure des rémunérations dans les pays en voie de développement (2).

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(1) Ceci est un résumé de la thèse développée par M. Blaug, "Approaches to Educational Planning", Economic Journal, juin 1967, pages 263-285.

Analyse coût-efficacité

Pour donner une idée de la façon dont on peut appliquer l'analyse coût-efficacité à l'enseignement, j'aimerais résumer les résultats d'une étude que j'ai faite avec l'aide d'un de mes collègues à l'Institut Pédagogique de l'Université de Londres, sur les tendances d'évolution de la productivité globale de facteurs dans l'enseignement secondaire et supérieur en Grande-Bretagne (3). Par "tendance de la productivité globale des facteurs", on entend une série chronologique retraçant l'évolution de la production par unité d'une combinaison de facteurs, toutes les variables étant mesurées à qualité constante. On a admis par convention que les facteurs de production comprenaient :

(1) le temps des étudiants, mesuré en fonction des gains réels auxquels ceux-ci ont renoncé en poursuivant leurs études,

(2) le temps des professeurs et des agents administratifs mesuré d'après leurs traitements réels, et

(3) les services fournis par les bâtiments et le matériel scolaires mesurés par les loyers imputés et les dépenses de matériel.

Les mesures de ces diverses quantités ont été ensuite fondues en un indice pondéré des facteurs de production, les coefficients de pondération étant les parts respectives des différents facteurs dans l'ensemble des dépenses directes et indirectes, pour le niveau d'instruction considéré. La production, d'autre part, a été évaluée en fonction des différentes conceptions du rendement de l'enseignement, à savoir :

(1) le nombre d'étudiants qui terminent un cycle d'études ;

(2) le nombre d'étudiants qui terminent un cycle d'une durée normalisée, les études plus longues étant considérées comme génératrices d'un supplément de production ;

(3) le nombre d'étudiants qui terminent un cycle d'études d'une durée normalisée dans différentes matières, certaines recevant un coefficient de pondération plus élevé que les autres ;

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(1) Voir l'article de M. Blaug, "An Economic Interpretation of the Private Demand for Education", *Economica*, mai 1966, pages 166-182.

(2) Voir l'ouvrage de M. Blaug, *A Cost-Benefit Framework for Educational Planning in Developing Countries*, Washington, D.C. : International Bank for Reconstruction and Development, à paraître en 1968.

(3) Voir M.Woodhall et M. Blaug, "Productivity Trends in British University Education, 1938-1962", *Minverva*, été 1965, pages 483-498, ainsi que les "Commentaires" de H.G. Johnson et R. Stone et une "Réponse" de M. Woodhall et M. Blaug ; voir également M. Woodhall et M. Blaug, "Productivity Trends in British Secondary Education, 1950-1963", *Sociology of Education*, à paraître en automne 1968.

(4) le nombre d'étudiants qui obtiennent des notes déterminées aux examens, des notes plus élevées étant considérées comme un supplément de production ; et enfin

(5) les effectifs d'étudiants classés selon leurs capacités de gains futures telles qu'elles resortent des données croisées obtenues en combinant les trois critères de l'âge, de l'instruction reçue et des gains, étant entendu que les étudiants dont le potentiel de gains est relativement plus élevé sont considérés comme un supplément de production (1).

En fonction de chaque définition de la production, le numérateur du rapport entre la production et les facteurs de production, a pris une valeur différente de sorte qu'on a obtenu différents indices de la productivité globale des facteurs ou si l'on préfère du rapport rendement/coût. Nous avons appelé ces différents indices :

(1) "l'indice non pondéré",
(2) "l'indice d'instruction",
(3) "l'indice culturel",
(4) "l'indice de succès scolaire",
(5) "l'indice économique".

A notre surprise, tous les indices, à la fois pour l'enseignement universitaire et secondaire, évoluaient dans le même sens - celui de la baisse - au cours des périodes considérées. Autrement dit, en utilisant des ressources identiques et à qualité égale du produit obtenu, il fallait davantage de ressources pour former un élève de l'enseignement secondaire en 1963 qu'en 1950. Dans les deux cas, la baisse de la productivité globale des facteurs ou du rendement par unité de coût était importante : de l'ordre de 28 à 35 % sur une période de 23 ans pour les universités, et de 25 à 35 % sur une période de 12 ans pour les établissements secondaires.

D'ordinaire, on procède à l'analyse coût-efficacité de toute une série de projets entre lesquels on hésite à un moment donné et dont on veut savoir lequel est préférable dans les circonstances du moment. Il en va différemment dans le cas qui nous intéresse, où il s'agit d'étudier l'évolution à travers le temps du rapport entre le coût et le rendement d'un seul et même "projet" afin de déterminer si les ressources qu'on lui affecte sont utilisées avec une efficacité croissante ou décroissante. La conséquence la plus frappante de la constatation essentielle à laquelle nous sommes arrivés est qu'apparemment, on peut, pour juger les tendances du "rendement" de l'enseignement (au sens qu'on vient de donner à ce mot"), évaluer indifféremment le produit de l'éducation en fonction des buts "intrinsèques" de celle-ci ou de ses buts "extrinsèques" ; les résultats obtenus ne varient pas en dépit de la diversité des pondérations utilisées pour évaluer le produit. C'est là une conclusion qu'on ne saurait invalider en invoquant la hausse des frais de personnel et de matériel ; en effet, toutes les consommations de facteurs de production étant évaluées, dans nos calculs, en unités de pouvoir d'achat constant, la productivité globale des facteurs n'est pas l'inverse des coûts monétaires par élève ou étudiant. Comme chacun sait, les coûts unitaires ont fortement monté depuis vingt ou trente ans dans l'enseignement secondaire et supérieur britannique. On a expliqué cette hausse tantôt en faisant valoir qu'elle était inévitable (l'enseignement, activité où les possibilités de progrès techniques sont nécessairement limitées, devant rivaliser avec d'autres branches plus dynamiques pour se procurer du personnel, du matériel et des bâtiments), tantôt en disant qu'elle était pleinement justifiée par la "qualité" de plus en plus élevée de l'enseignement dispensé. Nous avons tenu compte, quant à nous, de tous les renseignements disponibles sur les améliorations introduites dans l'enseignement britannique au cours de la période considérée, et par divers procédés nous avons converti ces changements qualitatifs en changements quantitatifs. Certes, l'évolution de la qualité de l'enseignement est loin d'être connue de façon satisfaisante, et il est possible de soutenir que les résultats auxquels nous sommes arrivés sont simplement dûs au fait que nous avons laissé de côté des facteurs qualitatifs qui, jusqu'à présent, se sont révélés impossibles à mesurer (1). Mais si cette omission est réelle, elle vise tout autant l'explication classique de la hausse des coûts dans l'enseignement que nos propres calculs de l'évolution de la productivité du système éducatif. C'est aux tenants de la thèse adverse qu'il incombe maintenant d'infirmer notre conclusion, étant bien entendu que ce que nous sommes parvenus à établir, c'est moins un ensemble de chiffres précis qu'une présomption d'ordre général quant à l'évolution à long terme de la productivité de l'enseignement. A moins que l'on ne réussisse à montrer que nous avons négligé certains objectifs de l'éducation pour lesquels il aurait été possible de construire une échelle de mesure, ou que nous ayons omis de faire intervenir dans notre raisonnement certaines améliorations qualitatives susceptibles d'être chiffrées, il y a lieu de penser que la productivité ou le rendement par unité de coût a baissé dans les établissements secondaires et universitaires britanniques au cours de la décennie 1950-1960.

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(1) Il convient de noter que dans le cas des universités, nous n'avons évalué que le produit de l'enseignement, car nous n'avons trouvé aucun moyen d'évaluer la production de la recherche. Aussi, pour les universités, n'avons-nous inclus dans les facteurs de production que le temps de travail du personnel enseignant et la valeur des bâtiments et du matériel affecté à l'enseignement.

Il importe de bien voir que notre but principal était de prouver la validité d'une méthode de mesure de la productivité et de montrer que différents procédés de mesure ne donnaient pas forcément des résultats contradictoires. Nous nous sommes limités aux statistiques qui étaient dans le domaine public - celles-là mêmes dont d'autres se sont servis pour soutenir que la hausse des coûts unitaires recouvrait une amélioration de la qualité de l'enseignement - et il n'est pas douteux que nous avons été gravement gênés par la pauvreté des données qui existent sur la question en Grande-Bretagne, en comparaison de celles que l'on peut se procurer aux Etats-Unis par exemple. C'est ainsi que pour juger de l'évolution du rendement de l'enseignement supérieur à travers le temps, on est obligé de normaliser le facteur de production "temps des étudiants", en se référant aux résultats obtenus aux examens de l'enseignement secondaire ; or il se peut que la qualité de cet enseignement se soit élevée au cours de la periode et il faudrait pouvoir en tenir compte quand on mesure la "valeur ajoutée" par les universités. L'idéal serait donc de pouvoir comparer les notes obtenues à des examens nationaux par les jeunes gens âgés de 18 ans et par les mêmes lorsqu'ils atteignent 21 ou 22 ans. Malheureusement, l'Angleterre sélectionne les étudiants admis à entrer à l'université parmi ceux qui réussissent à la deuxième partie (advanced level) du "General Certificate of Education", laquelle consiste en une série d'épreuves par matière jugées par cinq jurys répartis dans l'ensemble du pays et dont les critères d'appréciation diffèrent quelque peu ; ces critères sont devenus plus rigoureux avec le temps, mais il n'existe pas de données de source indépendante, semblables à celles qu'a fournies le "Project Talent" américain, dont on puisse se servir pour estimer avec précision l'ampleur de cette évolution. De plus, à la différence de leurs homologues américains, les étudiants anglais qui terminent leur licence ne passent pas un examen national de classement au moment d'aborder les études du troisième cycle. Autrement dit, on n'a vraiment pas d'éléments solides pour estimer la "valeur ajoutée" par les universités britanniques, en entendant par là l'élévation du niveau d'instruction des étudiants entre l'époque de leur entrée à l'université et celle où ils obtiennent leur dernier certificat de licence (1). Cette insuffisance des données fausse à la fois la mesure du travail fourni par les étudiants dans tous les calculs destinés à faire ressortir l'évolution de la productivité des universités, et l'appréciation du coût et du rendement de l'enseignement tant secondaire que supérieur lorsqu'on définit ledit rendement en fonction des buts "intrinsèques" du système éducatif.

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(1) A titre d'exemple, si la qualité de la recherche universitaire s'est améliorée et si (hypothèse fort contestable, il est vrai) l'enseignement est réellement complémentaire de la recherche, il se peut que la qualité de l'enseignement supérieur ait augmenté sous des formes dont nos chiffres ne tiennent pas compte.

De même, nous avons admis que les différences de valeurs entre les professeurs correspondaient à tout moment aux différences entre leurs traitements, lesquels sont fonction de deux variables seulement, en Grande-Bretagne : les grades universitaires et l'ancienneté. Nous nous sommes efforcés ainsi de mesurer le facteur de production "travail des professeurs" en unités de qualité constante. Ce faisant nous avons totalement laissé de côté la question fort controversée du lien entre le rendement du travail des professeurs et le nombre des élèves par classe. Plus exactement, nous avons considéré qu'une diminution du rapport élèves/professeurs équivalait à une baisse de productivité, à moins qu'il ne fut prouvé par les statistiques que des classes à effectifs plus faibles élevaient la qualité de l'enseignement. En cela nous avons fait peu de cas du dogme pédagogique selon lequel les classes moins nombreuses améliorent la qualité. C'est qu'à vrai dire tout le but de l'exercice était de démontrer, premièrement, que même si ce dogme correspondait à une vérité, il faudrait mettre en regard de la qualité accrue de l'enseignement dispensé dans une classe à effectif réduit l'augmentation de son coût et, deuxièmement, que les renseignements disponibles ne corroboraient pas la thèse selon laquelle les meilleures classes sont celles qui comptent le moins d'élèves. Il est assez évident que si la qualité de l'enseignement dispensé

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(1) La même observation s'applique à moindre degré aux écoles secondaires britanniques : une explication plausible de la baisse de leur productivité serait que l'élève moyen soit de moins en moins doué pour les études secondaires à mesure que davantage d'élèves prolongent leur scolarité au delà de 15 ans. L'enseignement à donner à ces élèves pour les amener à un niveau d'instruction déterminé devrait être plus intensif et dispensé par des professeurs plus qualifiés. La réalité de cette évolution est toutefois loin d'être démontrée.

(mesurée d'après les résultats obtenus par les élèves aux examens) est réellement fonction de l'effectif des classes - affirmation que des études antérieures ont mises en doute - la relation n'est pas une fonction monotone ; c'est plutôt une fonction discontinue en escalier à plusieurs maxima et minima, lesquels varient avec la matière enseignée, les méthodes pédagogiques employées, l'âge des étudiants et leurs aptitudes. Là encore nous aurions aimé pouvoir faire intervenir explicitement la dimension des classes dans le calcul des consommations de facteurs de production, mais nous avons dû y renoncer faute de données suffisamment solides sur les effets des variations du nombre d'élèves par professeur. Le plus grand mérite que pourraient avoir les résultats de nos calculs serait d'inciter à mettre en question la croyance complaisamment entretenue dans les milieux enseignants selon laquelle le rapport élèves/professeurs est une variable parfaitement descriptive de la qualité de l'enseignement.

Enfin, même si l'on est partisan d'évaluer le coût et le rendement de l'enseignement en termes étroitement économiques, on se heurte au fait qu'en Grande-Bretagne les recensements ne fournissent pas de données sur les gains des individus classés d'après leur âge et leur niveau d'instruction. Les indications dont nous nous sommes servis provenaient d'enquêtes spéciales par sondage et ne permettaient pas de faire de distinction entre les étudiants selon le domaine dans lequel ils se spécialisaient. De plus, on peut penser que l'instruction contribue à la réussite matérielle des gens non pas simplement en accroissant leur capacité de gains, mais aussi en favorisant leur mobilité professionnelle et géographique (qu'il s'agisse pour eux de changer de métier, de branche ou de région). Il faudrait disposer de statistiques sur la mobilité des travailleurs classés par niveau d'instruction, chose qui n'existe pas en Grande-Bretagne, ni d'ailleurs dans la plupart des autres pays européens.

D'autre part, il existe dans le domaine de l'éducation des objectifs largement reconnus - comme l'égalisation des chances d'accès aux études supérieures dont nous avons dû renoncer à tenir compte, non pas par impossibilité de les exprimer par des coefficients de pondération à appliquer à la production, mais tout simplement parce que les données disponibles se révélaient inutilisables. On peut concevoir par exemple qu'égaliser les possibilités d'instruction offertes à tous les adolescents reviendrait à accroître la proportion des enfants de travailleurs manuels qui accèdent à l'enseignement secondaire long et à l'enseignement supérieur. Malheureusement, cette proportion n'a absolument pas varié depuis 1938 dans les universités et il n'existe pas de statistiques nationales qui indiquent comment elle a évolué dans les écoles secondaires postérieurement à 1950. Il n'est pas difficile de déterminer les caractéristiques des données dont on aurait besoin pour juger de l'efficacité avec laquelle l'école a accru les "chances de réussite dans la vie" des enfants issus de la classe ouvrière. Mais le fait est que ces données n'existent pas en Grande-Bretagne.

On pourrait multiplier presque indéfiniment les remarques de cette nature, en continuant à montrer quels sont parmi les renseignements nécessaires pour mesurer la productivité ou le rendement de l'enseignement, ceux dont on dispose et ceux qui font défaut. Le fait important est que l'analyse coût-bénéfice et coût-efficacité fournit un cadre de pensée qui fait ressortir de lui-même les lacunes les plus graves de l'information disponible. C'est là son principal mérite.

Selon Popper, les propositions scientifiques se distinguent des propositions métaphysiques par la propriété qu'elles ont de pouvoir être refutées. Non seulement les propositions scientifiques sont réfutables mais encore elles appellent la réfutation en tant que garantie du progrès scientifique. La constatation que la productivité des écoles secondaires et des universités britanniques a baissé depuis un certain nombre d'années, même si l'on définit leur production de différentes manières, appelle une réponse de la part des spécialistes de la psychologie et de la sociologie de l'enseignement et nous serions fort heureux qu'ils nous démontrent que nous sommes dans l'erreur. La seule règle que nous demanderons de respecter à ceux qui relèveront le gant est de s'en tenir à des variables quantifiables. Nous ne prétendons pas que les faits mesurables sont seuls significatifs ; simplement, ce qui ne peut s'exprimer en terme de "plus ou de moins" se trouve forcément exclu des facteurs de choix entre diverses formes d'action.

ALLOCATION OF RESOURCES TO EDUCATION – TOWARDS A THEORY OF SUBSIDY

by Joseph Froomkin

The contribution of education to welfare has been analyzed from a number of different angles. Both educators and the general public have looked upon the outputs of education non-quantitatively; education has been regarded by these groups as a means to spread enlightenment, knowledge, and improving the quality of life in a given country. Peripherally, though with increasing frequency, education has been cited as an important ingredient in the preparation of youngsters for the world of work. These statements are based on impressionistic appraisals of trends in employment and little effort has been exerted to measure the contribution of given types of education to preparation for specific trades or occupations.

Side by side with these impressionistic appraisals of education, a growing body of quantitative literature has been produced, mostly by economists. This research has tried to (1) measure how much the educational effort or the total stock of knowledge contributes to the gross national product, and (2) calculate internal rates of return[1]

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[1] Investment in education is measured in terms of the increased lifetime earnings accruing to a given individual. In effect, a rate of return is calculated which equates the increased expected income with the added expense and foregone earnings of continuing education.

* I would like to thank Professor R. Wolfson of Syracuse University, who helped develop the model, and Dr. H. Levin of Brookings for some criticisms. The responsibility for the conclusions is the writer's, and is not necessarily shared by U.S.O.E.

(profit) to individuals or society from different levels of educational attainment. Economists try to answer questions such as these: How much will the production of goods and services in a country increase if more is spent on education? How much more can a person be expected to earn if he graduates from high school as contrasted to grade school; college as contrasted to high school, etc.? In the second instance, the rate of return has been used to point out the profitability of investment in education as compared to alternative investments, say in plant and equipment.

These two approaches have not been brought together, either by translating the qualitative statements of educators and the general public into more quantitative terms, or by looking at some of the social implications (and the soundness) of the calculations of the quantitative exercises. This is the nub of the dilemma of introducing quantitatively-oriented techniques for decision-making into the charting of policy for education.

This chasm may explain why quantitative evaluations of educational policy have failed to influence educational planning even in the U.S., where the technique has been indulged in most actively. Possibly this has occurred because these exercises have failed to produce intuitively reasonable guidelines for the policymaker. For instance, there is general agreement that the needs and social aspirations of lower class students, especially Negroes, are not met by the educational system as it is constituted today. Should the policy of subsidizing the disadvantaged be changed because the internal rates of return from education are lower for Negroes, than, say lower middle-class students? The policy-maker will state a resounding "no" to this question. The economist does not have a very good comeback to him, because he has doubts that he is measuring all the relevant factors needed to calculate the correct rate of return. What is even more important, more and more economists are starting to doubt whether the relevant effect of education should be measured in terms of rates of return to individuals or society, or whether education should be looked at as a means of altering the relative distribution of income within our society.

The present paper attempts to present an alternative rationale to justify subsidies to education. As with most pioneering efforts, it raises as many questions as it answers.

Reasons for Questioning Present Quantitative Approaches of Measuring Educational Outputs

Before attempting to adopt and develop something new, it behooves one to examine critically what has been done before and explain why it is inadequate. The contribution of economists: notably Theodore W. Schultz, and his investment theory of education; Edward F. Denison's estimates of the contribution of education to national productivity; and the work on human investment pioneered by Gary Becker must be examined at the very outset.

An English economist has remarked that "the science of economics is almost as subject to fashions as the art of dressmaking" (Blaug, 205). The investment approach to education, first mentioned by Adam Smith and further elaborated by Alfred Marshall, has received renewed attention as a result of work by T.W. Schultz (Schultz, 1955), and has been further elaborated by a large number of other writers (see bibliography). The major point made by the proponents of this analysis is that past expenditures on education can be regarded as a stock of investment similar to investment in producing durable goods. Hence, education affects the productivity of the current population of a country as much as does the stock of physical capital. Schultz, for one, is willing to ascribe some of the growth in total productivity to investment in man (Schultz, 1962). He makes the point that the productivity of the 1950's or 1960's would be inconceivable with human resources that had the "capabilities per man (that) existed as of 1900 or even 1929 in the United States."

Another writer, Edward F. Denison (Denison, 1962) ascribes 23 percent of the growth of the national product to improvements in the quality of the labor force. He states, "This improvement in the quality of the labor force reflected changes that had been made in education of the young ...."

Jorgensen and Griliches in an ingenious article explain the increases in productivity in the U.S. during the period 1945-1965 as a function of quality improvements in capital and labor inputs. According to these two authors, the improvement in the quality of labor accounted for roughly 14 percent of the improvement in productivity (Jorgensen and Griliches, 1967).

If one were to put confidence in these estimates, one could then compare educational investments with other investments open to the economy, and determine the optimal needs to maximize the growth of the national product. Unfortunately, these estimates do not in any way indicate at what point education's contribution to the GNP starts declining, or what level of education is required for certain levels of technology.

The argument that education contributes to productivity has a great deal of intuitive appeal. Yet it cannot be pushed to its logical conclusion without some violence being done to it. If "a Ph.D. pill" were suddenly discovered, giving the total population of the U.S. the level of knowledge attained by Ph.D.'s from leading institutions, it is not likely that the national output would increase dramatically overnight. At best, as workers become interchangeable frictional employment may go down. Some unfilled jobs requiring high skills would be filled. Yet, with present technology, only minimal replacements of labor with capital are probably possible. Hence, until a new technology is introduced, no dramatic shifts in production can be expected.

The investment theory of education is also quite vulnerable if one credits the results of a number of cross-sectional studies. For example, in the U.S., educational attainment by industry does not correlate with the rate of technological change (Jaffe and Froomkin, 1968).

It is also quite possible that, to a large extent, the unexplained residual in the productivity of the U.S. economy is due to statistical problems which produce spurious correlations of increases in educational attainment to productivity. The residual may be due to (1) insufficient weight being placed on the increasing productivity of capital[1], it may also be (2) accentuated by the problems of using homogeneous production functions to estimate the contribution of labor and (3) the index number methods in the pricing of new products in GNP statistics, which tend to inflate the contribution of labor to GNP. The recent findings by Denison (Denison, 1967) that increases in productivity in Europe were not related to the magnitude of the educational investment add to undermining the confidence of social scientists in this type of analysis.

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[1] Jorgensen and Griliches can also be criticized on this ground. Their estimate of capital productivity is based on a narrow look at capital productivity series.

If educational investment does not contribute to growth of the national product, at least in the short-run, can educational investment decisions be based on the internal rate of return of various avenues of education?

Internal returns from education must be handled gingerly once they are taken out of the context of measures of a contribution to the level of production. They are significant, though, in a number of different contexts: (1) The internal (private) rate of return may be an indicator of the incentive necessary to induce a given proportion of eligibles to strive for a higher educational attainment. It is the reward which individuals expect for investing their time and money to acquire more knowledge, and (2) the difference in the rates of return for various levels of education may be used as a guidepost to equalize income distributions. The contribution of education to social externalities, as important as they may be, are not discussed in this paper.

The internal rates of return to education for different levels of attainment are probably determined by some form of "social function of demand for education". How much education is desired probably depends on the level of incomes in a given society, and the relationship of foregone incomes incurred in continuing one's education in relation to the cost of education, and the family income of the student. In other words, the higher the real family income in a society, the higher is the proportion of youths likely to wish to continue education longer; the lower the ratio of starting salaries to family income (or the chance to get an entry job at a young age) the more likely are youths to continue attenting educational institutions, if the costs of obtaining an education plus foregone income are higher in relation to family income, the proportion of young people likely to continue their education will be less.

This hypothesis is consistent with the assertion that part of the cost of education is consumption, and part of it is investment. It can be stated in a different way by asserting that the propensity to consume education is income elastic.

For a particular level of education, higher rates of return may be taken as a signpost that there is under-investment in that sector, and that more should be spent to drive the rate of return down. Or one may take the perverse point of view that no additional subsidies can be justified if internal rates are already high. This has been the substance of Professor Friedman's argument that college education should not be subsidized. Actually neither one of these positions is logically consistent with the orientation of a social policy designed to equalize incomes or opportunities. High rates of return to low levels of education, e.g. elementary education, may accrue to individuals in a country where elementary education is already universal, and no additional resources need be added. /1/ Conversely, high rates of return from college education may indicate shortages or under-investment, if these rates or return are higher than those from investment in secondary education. Yet, it may be necessary to channel investments to secondary education as well as higher education in order to increase the number of students eligible for post-secondary study.

/1/ Or these rates may reflect returns to brawn, rather than marginal returns to developing brains.

Current rates of return may, under certain circumstances, give a clue to allocation of resources. For instance, in a country with an egalitarian policy, or one which strives to reduce disparities of incomes, educational policy should be tuned in concert with a country's production function. The policy ought to try to fix the supply of educated people in such quantities that each subsequently higher level of attainment produces a lower rate of return than the preceding level. If the supply of labor is such that the internal rates of return for each increment of educational attainment is lower than for the previous one, income disparities within this particular country will be less than if each year of incremental educational attainment is rewarded more.

The Theory of Subsidies

A most general statement about the objectives of educational subsidies may be presented in the following terms: (1) If the objective of educational policy is to reduce income disparities (a) investments in education must first produce a monotonically downward slope in internal rates of return for each additional increment in educational attainment, and (b) educational investment policy should attempt further to reduce effective income differentials between different groups of the population by increasing the negative slope of this curve.

We shall limit ourselves below to discussing subsidies and income disparities. If we were to assume that a given rate of return is required to attract some proportion of the population to pursue their education, it is quite possible but unlikely that the internal rates of return for those completing a higher level of education will increase from present levels./1/

We intend to examine in this paper the relationship between different levels of subsidies to education,/2/ the rate of return, and its effect upon lessening income inequalities. As soon as one grants the assumption that a given rate of return is necessary to induce a given proportion of eligibles to be attracted to a given level of education, the only way of reducing the inequalities between those who are well-educated and those who are less well-educated is to reduce the amount of the individual's investment needed to complete a more advanced level of education. If a rate of return for a given level of education i is written as r_i, the investment for the ith level is denoted by I_i, the difference in income (Y) for those who have completed it will depend on

$$\Delta Y_i \quad = \quad F(\, r_i \, , I_i \,) \text{-------------------} (1)$$

In the simplest non-dynamic state, a subsidy (s) for level i may result in the acceptance of a smaller income differential than in the absence of the subsidy by that part of the population which chose to pursue their studies up to level i. If out-of-

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/1/ If rates of return have to be increased, the relative differences in income between levels of education become controlling.

/2/ Underlying this discussion is the simplifying assumption of homogenity of offerings by level of education.

pocket costs after the subsidy are

$$I_{i_s} = I_i - s_i$$

then

$$\Delta Y_{i_s} = F(\, r_{i_s}, I_{i_s} \,) \text{---------------------(2)}$$

Actually, the subsidy will affect r_{i_s} , in a number of ways. For instance:

1. The fact that a smaller investment is required to complete a given level of education reduces the risk (R) of not completing this level of education, and hence should reduce the expected rate of return.

This can be represented as follows:

$$\frac{\delta R}{\delta r} > 0 \text{---------------------------(3)}$$

2. The availability of a subsidy is likely to induce some portion of the more able persons to continue their education, as long as ability is a prerequisite for access to higher levels of education. Under these circumstances, those who attain a lower level of education are likely on the average to be less well-qualified relative to those who attain more than would be the case if no subsidy were available.

$$Q_i - Q_{i-1} < Q_{i_s} - Q_{(i-1)_s}$$

As an aside, it should be noted that in those countries where admission to higher levels of education is rationed, highly competitive, and currently subsidized (as is the case of the U.K. in higher education), broadening access on the U.S. non-selective pattern may result in lowering quality and reduce the average rate of return drastically.

3. Similarly, the number of persons (N) attracted to a level of education will increase, as the subsidy increases.

$$\frac{\delta N}{\delta S} > 0 \text{---------------------------(5)}$$

4. Just as numbers increase, the effect of the increased numbers is likely to reduce the rate of return (if demand does not change)

$$\frac{\delta r}{\delta N} < 0 \text{---------------------------(6)}$$

5. The effect of the subsidy on the rate of return will hence depend upon (a) the effect of the subsidy on the conception of risk by the students, (b) the influence of supply, given anticipated rates of return, on the rate of return in future years, and (c) changes in quality between students who go on to a higher level of education, and those who do not.

6. The effect of a subsidy on the demand for education needs some comment. The effect of granting a subsidy will raise the perceived rate of return from completing the next level of education given the wage rates set a time before the subsidy was available. Hence a much larger proportion of the population will opt to continue their

education than was true hitherto. In effect, in a stationary state, the ex-post return rates will be lower than those anticipated by the first wave of students when they decided to continue studying. The new low rates of return will discourage others in later years to spend more years in school, and eventually, as a result of the drying up of the supply, the rates of return will start rising again. This is nothing more than the familiar cobweb theorem.

In a dynamic society, by contrast, developments may be different. If technology is likely to require a higher proportion of highly educated persons, the subsidy rate may be set to attract more people to higher levels of educational attainment in line with future requirements.

Problems of Measurement

In order to estimate the effect of changes in subsidy levels, it will be necessary to collect and look at data about education in a novel manner. We discuss below the kind of statistics which will have to be gathered. This exposition is intended to stimulate a new direction in data collection and analysis.

Rates of Return to Education -- International Comparisons

Table 2 reproduces internal rates of return in a number of countries. The figures are not precise, and should be used only as rough magnitudes for purposes of comparison. A number of interesting observations can be made, though, on the basis of the data:

1. Internal rates of return for what may be called roughly the equivalent of a high school education fluctuate in most countries in the range of 12 to 17 percent. The enrollment of eligibles in high school appears to be much more dependent on the level of income in a given country than the rate of return. For instance, the private rates of return for high school are similar in the U.S.A., Mexico and Chile. The proportion of eligibles (defined for this purpose as children aged 15 through 19) in school vary from a low of less than 10 percent in Mexico, to roughly a quarter of the population in Chile, and nearly 80 percent of the population in the U.S.A. The per capita incomes in these three countries were $2,400 in the U.S.A., $400 in Chile, and $200 in Mexico.
2. As a rule the internal rates of return decline for each level of education up to and including high school. In some countries, notably Mexico, the U.S.A., and probably Venezuela they increase for those who go to or complete college. In those cases, it can be presumed that present post-secondary policies tend to increase concentration of incomes in the upper brackets.
3. There are undoubtedly international differences in propensities to consume education. Nevertheless, the low rates of return in Israel to secondary education, despite relatively higher levels of personal incomes have depressed secondary attendance rates (Table 2).

Shifts in Demand and Rates of Return

Just as there appears to be little international stability between levels of attendance and rates of return, there appears, on the basis of U.S. data, indications that rates of return change over time. It has been extremely difficult to isolate what share of the change is due to shifts in demand, and compare it to change which is due to shifts in quality of the labor force.

The most promising method is to attempt to measure relative changes in wages for a given occupation and educational level for new entrants. New entrants are likely to feel the impact of changes of demand and supply more clearly. Looking at relative changes in wage rates for different educational levels, occupation by occupation, is likely to keep those quality differentials which are translated into wage rates constant, and make it possible to measure shifts in relative wages for two time periods between persons with the same educational attainment (see Table 3). For instance in 1960, college graduates aged 25 to 34 earned median wages of $6,240 in professional occupations and $5,361 in the clerical sector. Similarly for high school graduates, with no college, a median wage of $5,818 was recorded in professional and technical jobs and $4,961 in semi-skilled trades.

During a given interval, one may expect that these differences in quality may persist. Unfortunately, the statistics cited above were collected in the U.S.A. for the first time in the 1960 census. We shall have to wait a few more years to test the reasonableness of this assumption.

Quality and Subsidies

Persons with the same amount of formal education often earn different amounts, depending upon their native ability. We have implied that the introduction of subsidies may very well accentuate these differences in earnings, as persons with the requisite ability will go on to higher levels of educational attainment. Their earnings will be higher, not only because they are smarter, but also because they can expect some additional return from their education.

There are a number of interesting theoretical implications to this proposition. For instance, if educational subsidies to a given level of students, say college students, are increased, but the number of spaces for college entrants remains constant, it is quite possible that higher education institutions will become more selective, and only admit the most gifted students. Under those circumstances, the concentration of incomes is likely to increase, rather than decrease. That is to say subsidies to students must be accompanied by availability of additional places if income concentration is to be lessened.

We have tried to quantify the range of outcomes by estimating earning differentials due to native ability in a rather crude way (see Table 4). Taking available data on differentials in earnings for high school graduates to whom military tests of intelligence were given during the Korean war (Cutright, 1967), we have tried to estimate (1) income differentials of high school dropouts, high school graduates, and college-going populations, which could be accounted by ability differences (Project Talent), and (2) the effect on the differences in incomes between high school and college-going populations, if financial constraints for going to college were removed in the

United States (Froomkin, 1968).

Our findings indicate that half of the income differential between dropouts and high school graduates, and one-third of the difference in the income between the population which stops at high school and college graduates can be accounted by differences in ability. These findings are at variance with those of Becker (Becker, 1964), but are fairly consistent with those for the United Kingdom (Blaug, 1965). As more detailed data covering the total United States become available in the next few months, we shall revise our paper, and become more sanguine about these findings if the new data support them.

Using the same curve of wage differentials relative to ability, we tried to estimate the effect of drawing an increasing number of high school graduates to attend college, on the assumption that financial constraints are removed (Froomkin (2), 1968). Our estimates indicate that the income differential between college students and persons stopping at the high school level is likely to increase further by 1 percent, if these constraints are removed.

Risk and Subsidies

We know very little about the way risk affects expected rates of return from education. Hence, we can say very little about the way increased subsidies will affect risk.

It is reasonable to postulate school completion rates are related to rates of return. In the United States, for instance, the risk of not completing four years of college in the 1950's was roughly double that of not completing high school. The risk also varied by income group. Within a given ability group, the risk of not completing high school for those whose parents were in the lowest socioeconomic group was roughly double the risk for those who were in the highest socioeconomic group. Hence, a reduction of risk through subsidies is likely to decrease considerably the necessary rate of return to attract a given proportion of students to higher education.

Summary

The objective of this paper was to present an alternative to the conventional theories for the allocation of resources to education. We also indicated some of the variables which ought to be looked at to evaluate the effects of subsidies on the pattern of the distribution of income for the population in order to gauge the effect of these subsidies. Finally, we hope to have conveyed to the reader the necessity of looking at the effects of educational investment serially, rather than in terms of simple inter-temporal analyses.

TABLE 1

Rates of Return to Schooling

Mexico 1963[a]			USA 1949[b]			USA 1957[c]	USA 1949[d]		USA 1959[d]	Israel 1950's[e]	
Years of Schooling	Private	Social	Years of Schooling	Private	Social	Private	Years of Schooling	Private	Private	Years of Schooling	Private
			1-2	+	8.9						
2-4	21.1	17.3									
			3-6	+	14.5						
5-6	48.6	37.5									
7-8	36.5	23.4	7-8	+	29.2						
9-11	17.4	14.2	9-10	12.7	9.5					9-12	6
			11-12	18.6	13.7	28					
12-13	15.8	12.4									
			13-14	6.2	5.4		13-15	7.4	10.0	13-16	9
14-16	36.7	29.5	15-16	18.7	15.6	15					
							16+	13.5	15.3		

a. Martin Carnoy, "Rates of Return to Schooling," Reprint by the Brookings Institution from the Journal of Human Resources, July, 1967, p. 368.

b. W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, April, 1963, pp. 134-136.

+. This indicates an infinite rate of return, given the assumption that education is costless to the individual to the completion of the eighth grade.

c. Giora Hanoch, "Personal Earnings and Investment in Schooling," unpublished Ph.D. dissertation, University of Chicago, 1965, p. 84.

d. Melvin Borland and Donald Yett, "Trends in Return on Investment in Higher Education," Tables 1 and 5, Rates for Males including those who reported no income. Rates are before taxes.

e. Gary Becker, Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, (New York: Columbia University Press, 1964), p. 134.

TABLE 1 (Cont'd)

Rates of Return to Schooling

	Great Britain[a] 1962-63			Chile 1959[c]		Venezuela 1957[c]		Columbia 1961[c]	
Age	Years of School	Private	Social	Years of School	Social[g]	Years of School	Social[i]	Years of School	Private[l]
				1-6[d]	24	1-6[h]	82	1-5	20
				7-9[e]	29				
								6-11[j]	19
				7-12[f]	17	7-11	17	6-11[k]	30
				13-17	12			12-17	19
15-18	11-13	13	12.5						
19-21	14-16	14[b]	6.5						

a. Mark Blaug, "The Rate of Return on Investment in Education in Great Britain," The Manchester School, Sept., 1965, pp. 259-260.

b. Blaug states "By using the alpha coefficient =.66, we have in fact standardized the earnings of graduates for the distribution of ability and social class origins among secondary school pupils: the evidence shows that undergraduates are a much more homogeneous group than secondary school pupils. Consequently, the private rate of return actually received by graduates is well above 20%," p. 260.

c. Martin Carnoy, "Rates of Return to Schooling," Reprint by the Brooking Institution from the Journal of Human Resources, July, 1967, p. 368.

d. Average Schooling 5.5 years.

e. "Special" secondary schooling (average = 8.5 years).

f. General secondary schooling (average = 11.5 years).

g. Rates for males and females.

h. Rate for primary graduates over illiterate urban workers.

i. Rates are probably for urban males only.

j. Technical Secondary School.

k. General Secondary Schooling.

l. Includes tuition. If institutional expenditures in private and public schools are considered equal, these rates are directly comparable to social rates for other countries. Rates for urban males only.

TABLE 2

Rate of Return and Income for Selected Countries

Country	School Attendance % 15-19 year olds in school	Rate of Return	Mean Income (in 100's of U.S.A. dollars)
Venezuela	13	17	6
Chile	27	17	4
Columbia	11	30	2
Mexico	10	17	2
Israel	25	6	9
United Kingdom	75	13	12
United States	80	18	24

TABLE 3

Relative Wages and Ability

	Relative Wage	% in Ability Quartile			
		Dropouts	High School No College	College Dropouts	College Graduates
Ability Quartile					
Low	1.00	54.5	38.5	18.6	2.2
2	1.28	27.0	32.2	16.7	8.7
3	1.48	12.9	21.9	34.0	27.2
High	1.58	5.6	7.4	30.7	61.9
Relative Wage		94	1.00	1.13	1.24

BIBLIOGRAPHY

Becker, Gary S. *Human Capital, A Theoretical and Empirical Analysis With Special Reference to Education*. New York: Columbia University Press, 1964. pp.187.

Blaug, Mark. "The Rate of Return on Investment in Education in Great Britain." *The Manchester School* 33: 205-261; September 1965.

Carnoy, Martin. "Rates of Return to Schooling." Reprint by the Brookings Institution from the *Journal of Human Resources*. July 1967, pp. 359-374.

Cutright, Phillips. "A Pilot Study of Factors in Economic Success or Failure, Based on Selective Service and Social Security Records." Washington, D.C.: Department of Health, Education, and Welfare, Social Security Administration, Division of Research and Statistics, 1967.

Denison, Edward F. *Sources of Economic Growth in the United States and the Alternatives Before Us*. New York: Committee for Economic Development, 1962, pp. 297.

Denison, Edward F. *Why Growth Rates Differ: Postwar Experience in Nine Western Countries*. Washington, D.C. The Brookings Institution, 1967. pp. 446.

Froomkin, Joseph. "The Impact of Automation on the Labor Force," *International Encyclopedia of Social Sciences* (forthcoming).

Froomkin, Joseph and Jaffe, A.J. *Technology and the Labor Force*, Praeger, May 1968.

Hansen, W. Lee. "Total and Private Rates of Return to Investment in Schooling." *Journal of Political Economy* 71: 128-140; April 1963.

Jorgensen, D.W. and Griliches, Z. "The Explanation of Productivity Change." *The Review of Economic Studies* 34: 249-283; July 1967.

Schultz, T.W. *The Economic Value of Education*, Columbia University Press, New York, 1957, pp. 442.

TABLE 4

Occupation and Median Earnings of Males 25 to 64 Years Old in the Experienced Civilian Labor Force With Earnings in 1959, by Years of School Completed, for the United States: 1960

Years of School Completed	All Occup. Categ.	Prof. Tech. & Kindred Workers	Farmers & Farm Mgrs.	Mgrs. Officials & Prop. Except Farm	Clerical and Kindred Workers	Sales Workers	Crafts. Fore. & Kindred Workers	Operat. and Kindred Workers	Service Workers Includ. Priv. House.	Farm Laborers and Foremen	Laborers Except Farm and Mine	Occup. Not Reported
Total, 25 to 64 years old	$5,083	$6,978	$2,447	$6,855	$5,216	$5,747	$5,444	$4,645	$3,799	$1,577	$3,504	$4,720
Elementary:												
0 to 7 years	3,400	4,605	1,441	4,477	4,340	3,631	4,385	3,803	2,941	1,204	2,830	3,657
8 years	4,474	5,443	2,414	5,523	4,824	4,580	5,157	4,612	3,624	1,986	3,760	4,399
High School:												
1 to 3 years	5,038	6,102	2,748	6,089	5,102	5,214	5,530	4,900	4,016	2,297	3,977	4,670
4 years	5,541	6,481	3,230	6,750	5,311	5,766	5,903	5,198	4,618	2,772	4,335	5,230
College:												
1 to 3 years	6,119	6,677	3,832	7,826	5,376	6,433	6,139	5,227	4,664	3,242	4,220	5,614
4 years or more	7,664	7,702	4,426	9,486	5,861	7,423	7,565	5,373	4,795	4,181	4,314	6,536
4 years	7,428	7,387	4,406	9,361	5,792	7,358	7,421	5,428	4,873	3,944	4,406	6,533
5 or more	7,968	7,968	4,517	9,777	6,094	7,661	8,037	5,210	4,591	---	4,109	6,541

Source: United States Census of Population 1960

BIBLIOGRAPHY

INVESTMENT APPROACH TO EDUCATION

Alexander-Frutscill, Marian Crites. Human Resources and Economic Growth, Menlo Park, California: Stanford Research Institute, 1963, pp. 398.

Anderson, C. Arnold, and Bowman, Mary Jean. Education and Economic Development, Chicago: Aldine Publishing Company, 1965, pp. 436.

Arrow, Kenneth J. "The Economic Implications of Learning by Doing," Review of Economic Studies, June 1962, pp. 155-173.

Astin, A.W. "Productivity of Under-Graduate Institutions," Science, Vol. 136, No. 3511, April 13, 1962, pp. 129-135.

Becker, Gary S. and Chiswich, Barry R. "Education and the Distribution of Earnings," American Economic Review, Paper and Proceedings of the 78th Annual Meeting, Vol. LVI, May 1962, pp. 358-369.

Becker, G.S. Human Capital, A Theoretical and Empirical Analysis with Special Reference to Education, Princeton University Press, 1964.

Bell, Chauncey F. Cost-Effectiveness Analysis as a Management Tool, Santa Monica, California: Rand Corporation, 1964, (Paper, AS36.R331.P2988).

Benson, Charles S. (Ed.) Perspectives on the Economics of Education. Boston: Houghton Mifflin Company, 1963.

Blaug, M. "The Rate of Return On Investment in Education in Great Britain," The Manchester School, Vol. XXXIII, No. 3, September 1965.

Blaug, Mark. A Selected Bibliography in the Economics of Education, London: Institu of Education, University of London, 1964, pp. 106.

Blaug, Mark. "An Economic Interpretation of the Private Demand for Education." Economica 33: 166-82; May 1966.

Bombach, Gottfried. "Long-Term Requirements for Qualified Manpower in Relation to Economic Growth." Economic Aspects of Higher Education (Edited by Seymour E. Harris) Paris: Organisation for Economic Co-operation and Development, 1964, pp. 201-21.

Borus, Michael E. "A Benefit-Cost Analysis of the Economic Effectiveness of Retraining the Unemployed," Yale Economic Essays, Fall 1964, Vol. 4, pp. 371-429.

Bowen, H.R. Toward Social Economy (New York: Rinehart, 1948).

Bowen, William G. Economic Aspects of Education: Three Essays. Princeton, New Jersey: Princeton University Press, 1964, pp. 122.

Bowman, M.J. "Converging Concerns of Economists and Educators," Comparative Education Review, Vol. 6, No. 2, October 1962, pp. 111-19.

Bowman, Mary Jean. "Schultz, Denison, and the Contribution of Eds to National Income Growth." Journal of Political Economy 72: 450-64; October 1964.

Bowman, Mary J. "Social Returns to Education," International Social Science Journal, Vol. XIV, No. 4, 1962.

Bowman, M.J. "The New Economics of Education," Educational Sciences, an International Journal, Vol. I, No. 1, 1966.

Carovano, J.M. "Financing Public Higher Education," 1969-1970, National Tax Journal, Vol. 19, No. 2, June 1966, pp. 125-137.

Chance, W.A. "Long-Term Labor Requirements and Output of the Educational System," Southern Economic Journal, Vol. XXXII, No. 4, April 1966.

Ciriacy-Wantrup, S.V. "Benefit-Cost Analysis and Public Resources Development," Journal of Farm Economics, Vol. 37, November 1955, pp. 676-689.

Correa, Hector. The Economics of Human Resources. Amsterdam: North Holland Publishing Company, 1963.

Daniere, Andre. Higher Education in the American Economy. New York: Random House, 1964, pp. 206.

Denison, E.F. "Education, Economic Growth and Gaps in Information," J. Pol. Econ., Vol. 5, No. 5, October 1962, pp. 124-8.

Denison, Edward F. "Measuring the Contribution of Education to Economic Growth." The Economics of Education: Proceedings of a Conference Held by the International Economic Association. (Edited by E.A.C. Robinson and J.E. Vaizey.) New York: St. Martin's Press, 1966. Chapter 6, pp. 202-60.

Dorfman, Robert (Ed.) Measuring Benefits of Government Investments. Washington, D.C.: Brookings Institution, 1963.

Duncan, O.D. "Occupational Components of Educational Differences in Income," Journal of American Statistical Association, Vol. 56, 1961, pp. 783-92.

Eckstein, Otto. Public Finance. Englewood Cliffs, N.Y.: Prentice-Hall, 1964.

Economic Council of Canada. "Education and Economic Growth in Canada," Monthly Labor Review. April 1966, pp. 377-380.

Feldstein, M.S. "Net Social Benefit Calculation and the Public Investment Decision," Oxford Economic Papers, Vol. 16, March 1964.

Feldstein, M.S. "The Social Time Preference Discount Rate in Cost Benefit Analysis," Economic Journal, Vol. LXXIV, June 1964.

Feldstein, M.S. "Opportunity Cost Calculations in Cost Benefit Analysis," Public Finance, Vol. XIX, No. 2, 1964.

Green, H.A.J. "Embodied Progress, Investment, and Growth," American Economic Review, XVI, No. 1, March 1966.

Habib, Hassan. Human Capital Formation, Lahore: Pakistan Administrative Staff, 1963.

Hansen, W.L. "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, Vol. 71, April 1963, pp. 128-40.

Harbison, F. and C.A. Myers. Education, Manpower and Economic Growth: Strategies of Human Resources Development, New York, McGraw-Hill, 1964. Reviewed by L.G. Reynolds, American Econ. Rev., Vol. 54, September 1964, pp. 782-83.

> Develops rationale for a set of human resource development indicators and applies them to 75 countries--Teachers, Scientists, Physicians per 10,000 population, percent of school age group in school.

Harbison, F. and C.A. Myers. Manpower and Education. New York: McGraw-Hill, 1965 (Country Studies in Economic Development).

Harris, Seymour E. The Economics of Higher Education. New York: Harper and Bros., 1961.

Harris, Seymour E. Higher Education: Resources and Finance. New York: McGraw-Hill, 1962.

Harris, S.E. (Ed). "Economic Aspects of Higher Education," OECD, 1964 (U.S. Agent: McGraw-Hill Book Company, New York).

Hiner, Lawrence G. "The Hazards of Benefit-Cost Analysis As A Guide to Public Investment Policy," Public Finance. Vol. 17, No. 2, 1962, pp. 101-117.

Hirsch, W.Z. "Analysis of the Rising Costs of Public Education." Study Paper No. 4, Joint Economic Committee, U.S. Congress, G.P.O., Washington, 1959.

Hirsch, W.Z. "Income Elasticity of Public Education," International Economic Review, Vol. 2, September 1961, pp. 330-39.

> Income elasticity defined as product of (1) regression coefficient relating expenditures per pupil to per capita personal income and (2) the ratio of average personal income to average school expenditures. Elasticities of 1.09 (US 1900-1958), .594 (51-52), .593 (54-55), .98 (St. Louis area 54-55) indicate lack of income elasticity of education for primary and secondary education.

Hirsch, Werner Z. and others. Spillovers of Public Education Costs and Benefits. Los Angeles: Institute of Government and Public Affairs, University of California, 1964.

Hirsch, W.Z. Education in the Program Budget. RM-4333-RC, Santa Monica, California: The Rand Corporation, 1965.

Hirsch, W.Z. and M.J. Marcus. "Some Benefit-Cost Considerations of Universal Junior College Education," National Tax Journal, Vol. 19, No. 1, March 1966, pp. 48-57.

> A short but indicative Benefit-Cost study using tangible variables, 1960 data. Summer education viewed as an alternative to full-time study develops a higher B/C ratio.

Holtman, A.G. "A Note on Public Education and Spillovers Through Migration," Journal of Political Economy, Vol. 76, No. 5, pp. 524-5.

Houthakker, H.S. "Education and Income," Review of Economics and Statistics, Vol. 41, No. 1, February 1959, pp. 24-28.

> 1960 Census data are used to make estimates of mean incomes for U.S. males cross-classified by eight education categories and twelve age categories. Coefficients of variation are provided to characterize the income distribution for these combinations (91 of them with adequate data). An after tax tabulation is also made and estimates are given of lifetime earnings of persons with each of the eight levels of education before and after taxes and with discount rates of zero, 3, 6, and 8 percent applied to earnings foregone while being educated.

Hunt, S.J. "Income Determinants for College Graduates and the Return to Educational Investment," Yale Economic Essays, Fall 1963.

Krutilla, John V. "Welfare Aspects of Benefit-Cost Analysis," Journal of Political Economy. Vol. 69, June 1961, pp. 226-235.

Lassiter, Roy L. "The Association of Income and Education for Males by Region, Race, and Age," The Southern Economic Journal. Vol. XXXII, No. 1, July 1965, pp. 15-22.

Lassiter, Roy L. The Association of Income and Educational Achievement. Gainsville: University of Florida Press, 1966.

Machlup, Fritz. The Production and Distribution of Knowledge in the United States. New Jersey: Princeton University Press, 1962.

Marglin, S.A. "The Social Rate of Discount and Optimal Rate of Investment," Quarterly Journal of Economics, Vol. LXXVII, February 1963.

Marglin, S.A. "The Opportunity Costs of Public Investment," Quarterly Journal of Economics, Voo. LXXVII, May 1963.

Marglin, S.A. Approaches to Dynamic Investment Planning (Amsterdam: North Holland, 1963).

Margolis, Julius. "Secondary Benefits, External Economics, and the Justification of Public Investment," Review of Economics and Statistics, Vol. XXXIX, August 1957.

McCullough, J.D. Cost Effectiveness: Estimating System Costs. Bethesda, Md.: Rand Corporation, 1965.

McKie, J.W., Editor. "Education and the Southern Economy," Southern Economic Journal Supplement, July 1965, pp. 1-128.

Miller, H.P. "Lifetime Income and Economic Growth," American Economic Review, Vol. 50, No. 4, September 1965, pp. 834-44.

Two methods for estimating lifetime income are contrasted: cohort analysis (i.e. longitudinal studies) and cross-sectional analyses. 1950 and 1960 Census data are used to estimate increase in average personal income for U.S. males born in four different decades classified by six educational categories, white-nonwhite, south-nonsouth. Results using both methods are shown.

Miller, H.P. "Income Distribution in the United States," U.S. Bureau of the Census, G.P.O., Washington, 1966, 306 pages.

Chapter 4, "Income and Education" is an extension of the ideas and tabulations in Miller's 1965 article.

Miller, Herman P. "Annual and Lifetime Income in Relation to Education: 1939-59," American Economic Review, December, 1960.

Miller, W.L. "The Economics of Education in English Classical Economics," Southern Economic Journal. Vol. XXXII, No. 3, January 1966.

Mincer, Jacob. "On-the-Job Training: Costs, Returns, and Some Implications," Journal of Political Economy. Vol. LXX, No. 5, October 1962, pp. 50-79.

Miner, Jerry. Social and Economic Factors in Spending for Public Education.

The Economics and Politics of Public Education, No. 11. Syracuse University Press, 1963.

Morgan, J. and M. David. "Education and Income," Quarterly Journal of Economics, Vol. 77, August 1963, pp. 423-37.

Moser, C.A. and P.R.G. Lazard, "Planning the Scale of Higher Education in Britain," Royal Statistical Society Journal Series A. Vol. 127, 1964, pp. 473-526.

This article details statistical aspects of the Robbins Report which makes recommendations on the scale of future higher education for Britain. Its objectives are: to project demands for (1) higher education and (2) manpower with a given education and the relationship between these two. See Stone 1965 and 1966.

Mushkin, Selma. Economics of Higher Education. Washington: Department of Health, Education, and Welfare, Office of Education, U.S. Government Printing Office, 1962.

Nelson, Richard R. and Phelps, Edmund S. "Investment in Humans, Technological Diffusion and Economic Growth," American Economic Review, Paper and Proceeding of the 78th Annual Meeting, Vol. LVI, May 1966, pp. 69-75.

O'Donoghue, Martin. Comments on M. Preston's "The Theory of Spillovers and its Connection with Education." Public Finance, Vol. 21, No. 1-2, pp. 200-05.

Page, David A. "Retraining Under the Manpower Development Act: A Cost-Benefit Analysis," Public Policy. Cambridge: Harvard University Press, 1964.

Preston, Maurice. "The Theory of Spillovers and its Connection with Education." Public Finance, Vol. 21, No. 1-2, pp. 184-99.

Renshaw, E.F. "Estimating the Returns to Education," Review of Economics and Statistics, Vol. 42, August 1960, pp. 318-24.

Schultz, T.W. The Economic Value of Education, Columbia University Press, New York, 1957, pp. 442.

Schultz, T.W. "Capital Formation by Education," Journal of Political Economy, Vol. 68, December 1960, pp. 571-83.

Schultz, T.W. "Investment in Human Capital," American Economic Review, Vol. 51, March 1961, pp. 1-17.

Schultz, Theodore W. "Education and Economic Growth."

Social Forces Influencing American Education, N.B. Henry, Ed. 60th Yearbook of National Society for the Study of Education, Part II, University of Chicago Press, 1961.

Schultz, T.W. "Reflections on Investment in Man," Journal of Political Economy, Vol. 70, No. 5, October 1962, pp. 1-8.

Smolensky, Eugene. "Investment in the Education of the Poor: A Pessimistic Report," American Economic Review, Papers and Proceedings of the 78th Annual Meeting. Vol. LVI, May 1966, pp. 370-378.

Soltow, L. "The Distribution of Income Related to Changes in the Distribution of Education, Age and Occupation," Review of Economics and Statistics, Vol. 42, November 1960, pp. 450-53.

Swift, W.J. and Weisbrod, B.A. "On the Monetary Value of Education's Intergeneration Effects," Journal of Political Economy. Vol. LXXIII, No. 6, December 1965.

Turvey and Prest, "Cost-Benefit Analysis: A Survey," Economic Journal, December 1965.

UNESCO. Economic and Social Aspects of Educational Planning. Paris: UNESCO, 1964.

Vaizey, John. The Economics of Education. London Faber & Faber, Free Press of Glencoe, 1962.

Weisbrod, B.A. "Education and Investment in Human Capital," Journal of Political Economy, Vol. 70, Supplement October 1962, pp. 106-23.

Weisbrod, B.A. External Benefits of Public Education. An Economic Analysis, Industrial Relations Section, Princeton University, 1964.

Weisbrod, Burton A. "Investing in Human Capital," Journal of Human Resources, Summer 1966, pp. 5-21.

Wiseman, J. "The Economics of Education," Scottish Journal of Political Economy, Vol. 6, February 1959, pp. 48-58.

Wiseman, J. "Cost-Benefit Analysis in Education," The Southern Economic Journal, Vol. 32, No. 1, Part 2, Supplement July 1965, pp. 1-12.

Woodhall, M. and M. Blaug. "Productivity Trends in British University Education, 1938-62." Minerva, Vol. 3, No. 4, Summer 1965, pp. 483-98.

ALLOCATION DES RESSOURCES DANS L'ENSEIGNEMENT : VERS UNE THÉORIE DES SUBVENTIONS

par Joseph Froomkin (Résumé)

Le but de l'étude est de présenter une solution nouvelle pour l'affectation des ressources dans le domaine de l'enseignement.

Les premières évaluations quantitatives des politiques en matière d'enseignement n'ont pas réussi dans leur ensemble à influencer la planification de l'enseignement même aux Etats-Unis, où pourtant les techniques quantitatives ont été très largement utilisées. L'analyse de l'enseignement sous l'angle de l'investissement qui a été mentionnée tout d'abord par Adams Smith et qui, plus tard, a été mise au point par Alfred Marshall a fait l'objet d'un regain d'attention à la suite des travaux de T.W. Schultz, puis a été complétée par un assez grand nombre d'auteurs. L'argument principal des promoteurs de cette forme d'analyse est que les dépenses déjà encourues dans le domaine de l'enseignement peuvent être considérées comme constituant un stock d'investissement ressemblant à l'investissement pour la production de biens durables. En conséquence, l'enseignement affecte la productivité de la population d'un pays à un moment donné tout autant que le stock de capital. On pourrait donc, en principe, comparer les investissements en matière d'enseignement avec les autres investissements que pourrait entreprendre l'économie et déterminer les besoins optimaux pour maximaliser la croissance du produit national. Malheureusement, les estimations des effets de l'investissement en matière d'enseignement n'indiquent en aucune façon à quel point la contribution du système éducatif à la formation du produit national brut commence à diminuer, ou quel volume d'enseignement est nécessaire pour obtenir des niveaux donnés de technologie.

La thèse selon laquelle l'enseignement contribue à la productivité a intuitivement beaucoup d'attrait. Cependant, il n'est pas possible de pousser ce raisonnement jusqu'à sa conclusion logique sans lui faire violence. Si une "pilule de doctorat" était soudainement découverte, qui confèrerait à l'ensemble de la population des Etats-Unis, le niveau de connaissances atteint par les détenteurs d'un doctorat formés par les institutions les plus éminentes, il n'est pas certain que l'output national augmenterait dramatiquement d'un jour à l'autre.

Si l'investissement en matière d'enseignement ne contribue pas à l'augmentation du produit national, au moins dans le court terme, est-il possible que les décisions d'investissement en matière d'enseignement soient fondées sur le taux du rendement privé de divers débouchés de l'enseignement ?

Le concept de taux de rendement internes dérivés de l'éducation doit être traité avec des précautions extrêmes lorsque ces taux de rendement ne sont pas analysés dans le contexte de l'évaluation de la contribution au niveau de la production. Ces bénéfices, cependant, ne sont pas négligeables dans tout un ensemble de situation :

(1) le taux de rendement privé peut être un indicateur du stimulant nécessaire pour encourager une certaine proportion de ceux que l'on accepterait, à rechercher un niveau d'enseignement supérieur. C'est le bénéfice que les individus attendent de l'investissement qu'ils font en temps et en argent pour acquérir des connaissances supplémentaires : et

(2) la différence entre les taux de rendement pour différents niveaux d'enseignement peut être utilisée comme un repère pour égaliser les distributions des revenus.

Pour un niveau spécifique d'enseignement, des taux de rendement plus élevés que les autres peuvent indiquer qu'il y a sous-investissement dans ce secteur et qu'il faudrait donc dépenser davantage pour réduire le taux de rendement. Bien sûr, on pourrait adopter le point de vue assez vicieux qu'aucune subvention supplémentaire n'est justifiée si les taux internes sont déjà élevés. En fait, aucune de ces positions n'est vraiment cohérente avec les orientations générales d'une politique sociale qui vise à égaliser les revenus et les opportunités. Les taux de rendement élevés pour les niveaux inférieurs de l'enseignement, c'est-à-dire l'enseignement élémentaire, peuvent bénéficier à des individus dans un pays où l'enseignement élémentaire est déjà universel ; il n'y a donc pas besoin de ressources supplémentaires. Réciproquement, des taux élevés de rendement tirés de l'enseignement universitaire peuvent déceler des pénuries ou un sous-investissement, si ces taux de rendement sont plus élevés que ceux des investissements dans l'enseignement secondaire.

Les taux actuels de rendement peuvent, dans certaines circonstances, faciliter la répartition des ressources. Par exemple, dans un pays poursuivant des politiques égalitaires, ou dans un pays qui vise à réduire les disparités des revenus, les politiques en matière d'enseignement devraient être conçues de telle sorte qu'elles produisent une offre de personnes instruites pour lesquelles à chaque niveau successif d'éducation plus élevé correspondrait un taux de rendement moins élevé que le niveau précédent.

La théorie des subventions

De façon très générale, on peut dire que les objectifs des subventions en matière d'enseignement sont les suivants : prenant pour hypothèse que les objectifs des politiques en matière d'enseignement sont de réduire les disparités des revenus,

(a) les investissements dans l'enseignement doivent d'abord produire pour chaque augmentation marginale du niveau d'enseignement des taux de rendement internes sous forme d'une pente descendante monotonique, et

(b) une politique d'investissements dans l'enseignement devrait s'efforcer, en outre, de réduire les taux réels de rendement dont bénéficient certains groupes de la population, en augmentant la pente négative de cette courbe pour ce qui est des taux de rendement sociaux.

Dès que l'on admet l'hypothèse qu'un taux de rendement donné est nécessaire pour encourager une proportion donnée des individus que l'on serait disposé à accepter, à se diriger vers un niveau donné d'enseignement, le seul moyen de réduire les inégalités entre ceux qui ont atteint un haut niveau d'enseignement et ceux qui ont atteint un niveau moins élevé est de réduire le montant d'investissements nécessaire pour atteindre un niveau plus élevé d'enseignement. Toutefois, si les subventions à l'enseignement pour un effectif d'étudiants à un niveau donné, disons par exemple les étudiants du niveau universitaire, sont augmentées, mais qu'en même temps le nombre des places disponibles pour les étudiants entrant à l'université reste constant, il est fort possible que les établissements d'enseignement supérieur deviendront plus sélectifs et n'admettront que les étudiants les plus doués. Dans ces circonstance, il est vraisemblable que la concentration des revenus aura tendance à augmenter plutôt qu'à diminuer.

Afin d'évaluer les effets des changements des niveaux de subvention, il sera nécessaire de rassembler et d'examiner les données qui concernent l'enseignement avec un regard neuf. L'étude examine ensuite les catégories de statistiques qu'il faudra rassembler.

THE ROLE OF COST MODELS IN EDUCATIONAL PLANNING – A CASE STUDY FOR THE FEDERAL REPUBLIC OF GERMANY

by Klaus Hüfner and Enno Schmitz

Contents

I. INTRODUCTION 226

II. EDUCATIONAL PLANNING, PUBLIC BUDGETING, AND COST/BENEFIT-ANALYSIS 226

- 1. Educational Planning
- 2. The Information Structure as an Integrative Dimension
- 3. Public Budgeting
- 4. Cost/Benefit Analysis as a Tool of Information for Public Budgeting and Educational Planning

III. A MODEL FOR ESTIMATING EXPENDITURE ON SCHOOLS IN THE FEDERAL REPUBLIC OF GERMANY 233

- 1. Description of the Model
  - a. The transformation function and the components of input
  - b. The costs of factors
- 2. Statistical Results of Alternative Projections of Expenditure on Schools until 1975
- 3. Discussion of the Model
  - a. Limitations and built-in uncertainties of the output function
  - b. The rate of depreciation – a strategic variable in educational planning
  - c. Financing teacher inputs

IV. CONCLUDING REMARKS 246

I. INTRODUCTION

The purpose of this paper is to discuss an empirical cost model. Originally, this model was worked out to assess future trends of school expenditure in the Federal Republic of Germany (FRG). Instead of discussing in detail the empirical results of the model, we intend to describe its structure and to assess its intrinsic value within the framework of educational planning. Therefore, we start with a conceptional description of this framework; the model's relevance for planning purposes will be examined in the second part of the paper.

Cost models represent a link between educational activities and their economic implications. Since all public activities are supposed to be co-ordinated within a public budget, we should try to find out the similarities and differences between educational planning and public budgeting in general. For this purpose, we use the tools of systems analysis. We treat educational planning and public budgeting as processes which take place between different units and are connected by a communication network. By using the language of systems analysis, we try to offer an integrated view of educational planning, public budgeting, and cost models.[1] Within this context, we are able to discuss the cost model as a potential information tool in educational planning, thereby showing its limitations. This approach helps us to envisage further possible improvements of cost models. Within the traditional framework of economic theory, the methodological aspects of cost models are part of the cost/benefit analysis. Without going into details of measurement[2], we intend to interprete the possible uses of cost/benefit analysis at the different stages of the educational planning process.

II. EDUCATIONAL PLANNING, PUBLIC BUDGETING, AND COST/BENEFIT ANALYSIS

1. Educational Planning

Before starting on the role of cost models in educational planning, let us give some details about our conceptual framework[3], and explain briefly why we start with the systems approach. There are two reasons for this. First of all, it is impossible to use only one "language" for an adequate treatment of such a complex social system as the educational system. Economic approaches *per se* cannot be used as a tool for political decision making[4]. We need common symbols as a basis for an integration of the social sciences as well as for interdisciplinary research. Secondly, we think that systems analysis offers the opportunity of raising new questions. This does not mean, however, that the systems approach gives detailed explanations of social phenomena.

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[1] This does not mean, however, that such a system exists already in the FRG.

[2] For an excellent review of problems related to cost/benefit analysis, see PREST, Alan R. and TURVEY, R., "Cost-Benefit Analysis: A Survey", *Economic Journal*, Vol. 75, 300, December 1965, pp. 683-735.

[3] What will be said about "educational planning" is relevant to all types of social (systems) planning. Furthermore, educational planning is part of human resource development planning, but only a part.

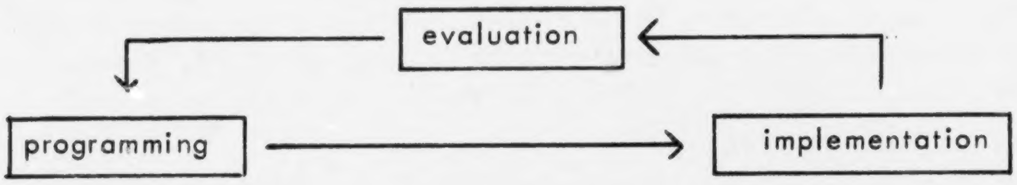
[4] See, e.g., WISEMAN, Jack, "Cost-Benefit Analysis in Education", *Southern Economic Journal*, Vol. 32, 1, Part 2, July 1965, pp. 1-12.

(1) We think that there is as yet no theory of the behaviour of social systems which describes, explains and predicts how a society develops its human resources. Approaches to education planning often mentioned, such as the famous "rate-of-return approach" and "manpower approach", are no substitutes for such a theory. They are useful tools as programming techniques, thereby offering additional information for the political decision process.

(2) We treat the educational system as a complex social system which can be influenced. Its behaviour is a priori not fixed, which means that the internal elements of the system as well as those systems with which it is related can change its structure of behaviour over time.

(3) Educational planning must, therefore, explicitly take into account uncertainty. It should be treated as a process without fixed periods and without fixed targets. We propose to analyze the educational planning process as consisting of three phases, which are connected by information flows within a communication network. These phases are: (i) programming, (ii) implementation, and (iii) evaluation.

The educational planning process, as shown in Graph 1, takes place at all levels of the planning structure in which the educational system, as traditionally defined, is one of the sub-systems. While the educational system in its traditional sense usually consists of all institutions of formal education, our "image" of the system also includes the administrative superstructure. This means that we are concerned with the regulator system and the planning object system as a whole. It is important to recognize that the same educational targets demand completely different strategies at different levels of activity[1].



Graph 1

Graph 1 consists of three phases arranged to indicate the idea of a rolling planning process. After the programming phase, in which models of consistence with regard to targets and means are developed, the implementation phase leads to a new state of the system. Educational planning is treated as a control system: the planning process is seen as a permanent feedback control, taking into consideration an evaluation phase as feedback. Educational planning becomes a continuing process of learning and revision[1].

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[1] In the case of the Federal Republic of Germany, e.g., it would be necessary to describe in detail a decentralized regulator system which is responsible for educational planning.

Programming, implementation and evaluation can be interpreted as activities performed by the same or by different units at one or more levels. It is, therefore, difficult *a priori* to identify the regulator system in relation to the planning object system. At the lowest level of the planning structure, the class room level, the activities of programming, implementation, and evaluation are often performed by a single regulator system, the teacher. But even at this level the planning object system, the pupil body, is still a complex social system; its behaviour cannot be explained or predicted by simple programming or implementation techniques. In other words, our present knowledge about social systems is too limited to serve as a guide for direct decisions. What is needed is an institutionalized competition among different schools of thought which could help the decision-maker to identify the relevant alternatives and to clarify their respective implications[2].

Whenever we try to analyze the educational planning process, we have to take into account the number of activities, the number of units performing these activities, and the number of levels at which these activities take place. Clearly, the picture will soon become extremely complicated, because it is not only necessary to analyze the relationships between programming, implementation and evaluation at each level, but also the relationships between the different levels.

2. The Information Structure as an Integrative Dimension

All the different elements and sub-systems of the educational system are connected by information channels, through which information is exchanged. We are interested, *inter alia*, in knowing more about the structure of this network, the quantity and variety of information stored in the system, and the nature of the system's memory facility.

The whole information system has to be organized in a way that is appropriate for the decision process. We know that the decision units within the system need different types of information according to their tasks. Instead of discussing the centralization *versus* decentralization issue, we propose to deal with the following two questions:

(1) which unit makes what decision?

(2) what types of information does it receive, which signals does it send out, and how does it evaluate the degree of correspondence between its messages and the actions taken by others?

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[1] For details see
HÜFNER, Klaus and NAUMANN, Jens, "Möglichkeiten und Grenzen der Ansätze zur Bildungsplanung in der Bundesrepublik Deutschland," Paper given in Karlsruhe in June, 1966. To appear in volume 4 of the series *Forschung und Planung in Einzeldarstellungen*, edited by the Studiengruppe für Systemforschung, Verlag R. Oldenburg, München.

[2] This problem of interaction between science and policy needs, however, further elaboration which cannot be undertaken in this paper.

The first question deals with the problem of organization, while the second stresses the problem of information.

With regard to the latter, we have to ask what specific type of information is of importance for the programming, implementation and evaluation activities within the planning process. In the following, we shall consider four types of information.

(a) First of all, we need detailed information about the educational institutions, i.e., the educational system as traditionally defined.

We treat the educational system as a kind of "black box", which means that we possess only a limited knowledge about the process taking place within this system. We roughly know inputs - pupils or students, teachers, physical items (buildings, books, and other learning aids), educational aims - and outputs - graduates with different amounts of education. The transformation function between inputs and outputs is largely unknown. We know little about the contribution of different curricula or different teaching methods to the output.

Until recently, basic data, such as enrolment ratios differentiated by geographic regions and by socio-economic categories, have not been available in the FRG. It is obvious that we need more data to establish an educational planning process as suggested above/1/. The economic system produces statistical information as a by-product of its performance for internal (book-keeping) and external (tax legislation) evaluation purposes. In the educational system, however, we do not have such a built-in data-collecting mechanism. It is, therefore, necessary to build up processes of data collection which are relevant to the purposes of educational planning.

The use of input-output analysis marks an advance in identifying pupil and student flows, the number of drop-outs, repeaters and graduates. Further progress is expected from advances in computer simulation which will make it possible to drop a number of simplified assumptions and to design models which offer more detailed information.

Given certain political decisions with regard to priorities of educational policy, the programming unit will be able to design programming models of the consistence model type. This means that given targets for future periods will have to be expressed in quantitative terms. The programming unit will be able to test whether these decisions could be implemented in a given educational system, assuming that all the decision units, including the private households in question, are willing to cooperate in reaching these targets.

Empirical studies about the determinants of transition coefficients of the educational system might possibly indicate whether or not certain targets can be reached in a given time period/2/.

/1/ It should be mentioned here that the general statistical requirements as proposed by OECD need further specification for the planning set-up of individual member countries. See Methods and Statistical Needs for Educational Planning, OECD, Paris, 1967, 363 p.

/2/ This kind of information is not produced by official statistics. For the FRG, a research team in Heidelberg intends to undertake an empirical study which will provide strategic data on the social demand for education.

(b) The second type of information has to be collected directly by the implementation unit. It is directed at those units of the system which are in charge of the implementation of educational targets. This type of information consists of instructions and the delegation of decisions to the lower levels of the planning structure. The planning targets, formulated by decision units at the top level, have to be specified for immediate action at lower levels. Therefore, we may call this a process of information specification. The level-by-level disaggregation implies also the creation of new information.

(c) The third type of information describes the realized state of the system, i.e., the success or failure of the implementation process. It is of great importance for the evaluation units, which deal with its transmission. The evaluation process is thus concerned with an aggregation of information.

Whereas the second type of information flow is a necessary condition for the implementation process, the third type is necessary for the evaluation process. Within the planning structure, these two types of information run in opposite directions to each other.

(d) The programming unit needs a fourth type of information, which considers possible changes in the targets of the political decision units as well as new educational research results relevant to the planning process.

3. Public Budgeting

Whereas educational planning covers one social activity only, the budget fulfils a co-ordinating function for all public activities. The budget can be characterized as a common denominator of the various government programmes. If we consider only the allocation budget and disregard its distribution and compensation function[1], the task of public budgeting consists in establishing a consistent government programme, thus striking a balance between the resources available and the needs of the various sectors. Referring to Graph 1, one can say that budgeting is the multidimensional and overall performance of programming, implementation, and evaluation.

This means that the budgetary process is not a mere addition of planning processes of the single department units, but an integration and co-ordination of these processes at a higher decision level. The main purpose of public budgeting is reflected in the informational connections between the budgeting unit and the different social planning units. A prerequisite of this information is that each planning unit should express its programme in monetary terms, i.e., in the language of the budget.

Today, one of the main characteristics of budgeting is that the output of social activities is usually not explicitly stated. The programming as well as the implementation activities of the budget unit are performed by administrative units, independent in their organization and, at least partly, in competition with each other. Detailed negotiations between the department units and the finance unit are necessary to establish the budget "plan"; this process takes place at different levels and in mutual contacts between several administrative units. The special programmes are developed within the single department units. The finance unit tries to equate the planned expenditures with the amount of money available. In the case of disagreement between a single department unit and the finance unit, the final decision will be made by the highest decision unit within the budgetary planning structure, i.e., the cabinet. Generally, there is no planning organization attached to the highest decision unit. The result of the cabinet's decisions is a more or less successful compromise, which depends more upon the bargaining power and negotiating skills of the participants than upon a generally accepted programme conception.

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[1] MUSGRAVE, Richard A., Theory of Public Finance, New York, Toronto, London, McGraw Hill, 1959, pp. 3-27.

It is interesting to note that the observer will have difficulty in finding out where the most important decision was made. The decision process takes place partly within the different department units, partly between the department units and the finance unit, and partly at cabinet level.

Since the budget is an essential tool for social planning, a new concept has been proposed, called programme budgeting. "The unique function of a programme budget is to implement the conclusions of a political philosophy through the assignment of resources for their accomplishment. The main advantage claimed for the programme budget is that it promises to do this more effectively and more efficiently by (1) providing a framework for more clearly defining the alternatives among which choices must be made, and (2) creating an information system that will assist in measuring costs in relation to accomplishments."[1]

If properly used, the programme budget represents a considerable advance over the present budget procedure, which has at least two major defects:

(1) programmes of activities are mainly considered within the limits of the department units in which they occur;

(2) the present budget is still mainly concerned with appropriations and expenditures for one year; it contains the figures for the last completed year, and the estimates for the current year and for the year to which it relates.

A programme budget is supposed to be organized in terms of categories which are close to being outputs, whereas in the traditional budget the categories are generally related to inputs with some mixture of ill-related outputs, based upon administrative history[2].

Furthermore, a programme budget deals with a longer time span, and could thus help in annual budgeting by giving public activities a time profile. Programmes would contain all future financial requirements, thereby giving a better basis for evaluation[3].

[1] ANSHEN, Melvin, "The Federal Budget as an Instrument for Management and Analysis", p. 18, In: NOVICK, David (ed.), Program Analysis and the Federal Government. Harvard University Press, Cambridge, 1965, 382 p.

[2] See
McKEAN, Roland N., and ANSHEN, Melvin, "Limitations, Risks and Problems", p. 286. In: NOVICK, David (ed.) Program Analysis and the Federal Government, Harvard University Press, Cambridge, 1965, 382 p.

[3] Programme budgeting must thus be linked with the annual budget cycle, since it is unlikely that parliament will change this rule.

The concept of budgeting includes two other aspects which should be mentioned. First, it stresses explicitly appropriate implementation provisions, thereby requiring a complementary organization of the information structure for decision-making. Secondly, programme budgeting calls for the use of cost/benefit analysis in the overall decision-making process.

4. Cost/Benefit Analysis as an Information Tool for Public Budgeting and Educational Planning

Cost/benefit analysis tries to compare measurable benefits with the costs of achieving them. For this purpose, the information structure has to provide data which will permit estimates of costs and benefits of alternative future social actions.

When we talk about cost/benefit analysis, we think in terms of an additional information tool for decisions to be made by single programming or evaluation units within the planning apparatus. To clarify this point, we should say that we do not think that cost/benefit analysis can offer criteria for political actions in the sense the neoclassical allocation model pretends to do. In this sense, we agree with FISHER who states: "Contrary to what some of the more enthusiastic advocates of quantitative analysis may think, we visualize cost/utility analysis as playing a somewhat modest, though very significant, role in the overall decision-making process. In reality, most major long-range planning decision problems must ultimately be resolved on the basis of intuition and judgment. We suggest that the main role of analysis should be to try to sharpen this intuition and judgment. In practically no case should it be assumed that the results of the analysis will make the decision. The really interesting problems are just too difficult, and there are too many intangible (e.g., political, psychological, and sociological) considerations that cannot be taken into account in the analytical process, especially in a quantitative sense. In sum, the analytical process should be directed toward assisting the decision-maker in such a way that (hopefully!) his intuition and judgment are better than they would be without the results of the analysis."/1/

FISHER refers to the use of cost/benefit analysis for programming purposes in public budgeting. In this context, it may be useful to differentiate between the ex ante and ex post application of cost/benefit analysis. In organizational terms, this means that within the budgeting process the programming unit undertakes cost/benefit comparisons before, and the evaluation unit after, the implementation. The same, of course, is true for educational planning.

Seen from the point of view of the programming unit, cost/benefit analysis can, for instance, indicate whether it would be economically meaningful to substitute capital for labor in the educational transformation process. Given one measurable type of educational output, the estimation of costs by detailed analysis of educational inputs and of different input combinations can indicate the most efficient combination. This type of (ex ante) cost/benefit analysis is a useful information tool of the programming

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/1/ FISHER, Gene H., "The Role of Cost-Utility Analysis in Program Budgeting", p. 67-68. In: NOVICK, David (ed.) Program Analysis and the Federal Government. Harvard University Press, Cambridge, 1965, 382 p.

unit[1]. However, it is not the only one; there are other useful techniques for clarifying and comparing the relevant alternatives, and they should all be used simultaneously if possible.

Despite the fact that we can use the same systems approach to analyze public budgeting as well as educational planning, the quantity as well as the quality of alternative actions differs to a very large extent in each case. Whereas (*ex ante*) cost/benefit analysis in educational planning deals with *intra-sectoral* alternatives, the programming unit in public budgeting is concerned with the whole range of social programmes and has, therefore, to compare the number of *inter-sectoral* alternatives.

The second type of cost/benefit analysis will be used by the education department for ex post comparisons. The education department receives the figures which indicate whether the targets could or could not be reached on the basis of estimated costs. The comparisons are, at the intra- as well as at the inter-sectoral level, global ones. The use of the second type of analysis as a tool of information for evaluation purposes will be extremely meaningful if the benefits are formulated before the implementation process takes place. This is a necessary condition of the use of *ex-post* cost/benefit analysis for evaluation purposes.

III. A MODEL FOR ESTIMATING EXPENDITURE ON SCHOOLS IN THE FEDERAL REPUBLIC OF GERMANY

The processes of educational planning and public budgeting described above shall constitute the framework of reference for the following discussion of an empirical cost model. Such a distinction between the abstract development of a concept of planning on the one hand and the discussion of a specific programming technique, i.e. the cost model, on the other hand,became necessary by the circumstances under which the model had to be designed. Thus, the original purpose of the model was limited to the quantitative assessment of the potential future expenditure for schools in the FRG. These forecasts form part of a study which tries to indicate the margin for an expansion of educational expenditure within the public budgets of the central government, the states, and the municipalities in the FRG until 1975[2]. Thereby, the model had only to offer information for a recommendation by the Bildungsrat[3]. Therefore, the Bildungsrat did not ask for a specific planning concept underlying the model's construction. Because of this, the following discussion should be understood as an evaluation of the model's relevance for a planning process.

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[1] Some experts call this type of cost/benefit analysis "cost/effectiveness analysis". They argue that this type of analysis implies a benefit which is already known to be worth achieving.

[2] Besides this model and its projections of public expenditures for schools the study contains a rough projection of expenditure for universities as well as projections of total public revenue and total public expenditure (educational expenditure excluded):
DEUTSCHER BILDUNGSRAT, Gutachten und Studien der Bildungskommission, *Sozialprodukt, öffentliche Einnahmen, öffentliche Ausgaben und Bildungsausgaben*, Klett-Verlag, Stuttgart 1968 (forthcoming).

[3] The Bildungsrat (Council on Education) might be, in terms of our planning concept, classified as a "quasi-decision" unit i.e. a unit which has no implementation power. The Council is supposed to offer recommendations and a reform plan for the educational system in the FRG at the end of its first working period of four years (1969).

It should be noted at the outset that the model does not deal at all with problems of measurement or evaluation of the output, but with alternative volumes and compositions of the educational input. Specific types and volumes of output are assumed as variables that are exogenously determined. The model is thus suitable for purposes of cost-effectiveness analysis, i.e., considerations about alternative compositions of input to attain a defined output. The empirical results of the model offer information of the most aggregated kind, because, the model views the school system of the FRG as a global one (macro model). This high degree of aggregation has some effects on the kind of conclusions which can be drawn from the model. In the FRG, the economic system is totally integrated and public finance depends mainly on a relatively centralized tax legislation and on various interdependencies between the budgets of the Bund (Federal Government), the Länder (States), and the Gemeinden (municipalities). On the other hand, the responsibilities for the administration and financing of schools is completely within the competence of the Länder and the Gemeinden. There is no competent decision unit at the federal level which co-ordinates the school activities of the regional authorities. This means, in the case of our cost model, that the data presented are not related to any decision unit of the political system. The model could thus be compared to the national accounting scheme of a country which has no economic planning: it gathers data about the activities of independent units, which are not directly controlled by a central authority.

The model starts from the following assumptions.

(1) It does not take into account any regional differentiation. It is established, on the "national" level, not by an aggregation of cost models from the regional subunits, but by nation-wide aggregates and objectives.

(2) The definition of education does not raise difficulties in the design of the model because the study is concerned with the present educational institutions. An a priori definition has been given in the same way for the costs. The model covers only public outlays.

(3) Despite this narrowly defined base, the model may also offer a conceptual framework for discussions about cost implications of educational reforms.

1. Description of the Model

In the following presentation, a distinction should be made between the cost aspects of, and the interrelationships between, real items, such as teachers, pupils or students, buildings etc. Since no sound educational plan was available, a model of the school system had to be constructed as a base for the cost model. This construction has been done in such a way that a "costing" by means of the available, relatively meagre financial statistics has been made possible.

The model is based upon the present school system in the FRG/1/. Alternative

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/1/ Its structure should be described shortly. At the first level, there are two institutions: the primary schools (Grundschulen) and special schools for handicapped children (Sonderschulen). The second level of general education contains two types of lower secondary schools (Hauptschulen in compulsory education and Realschulen in further education) and one type of upper secondary schools (Gymnasien). Vocational schools are Berufsschulen and Berufsaufbauschulen as part-time institutions and Berufsfachschulen and Fachschulen with full-time curricula. Lastly, the model includes two types of colleges, the Ingenieurschulen (technical) and Höhere Fachschulen (non-technical), as parts of the third level.

projections, made within the model, do not take into account any changes in institutional patterns. It is generally assumed that future educational development will be caused only by a further growth of school population and enrolment ratios. These - relatively autonomous - determinants of educational development are linked with alternative inputs of teachers, buildings, and other factors.

The choice of disaggregation of the school system into eleven educational institutions does not give an insight into the processes within and between the different levels of the school system. The official data available for projection purposes are only classified by types of schools, not by classes and age groups. The general assumption had, therefore, to be made that transition processes between and within the levels of the school system will adapt themselves to changing population growth and enrolment ratios in such a way that the consistency of the system is maintained.

a. The transformation function and the components of input

Educational costs assume by implication an educational transformation function. In this specific context, it means that an analysis concentrated on the cost side, i.e., the inputs in the educational process, must give some idea of the output in this process. If today education is recognized as an instrument of social change and as a contribution to economic growth, educational output should be evaluated and measured. But this measurement becomes important only if there is any need for changing the institutional patterns of the educational system. In this case, it would be necessary to assess and compare the new and the old system, thereby quantifying the costs as well as the benefits of both. But as long as we do not take into consideration any institutional changes within the school system, we need not discuss its output. Roughly speaking, the output may consist of the results which the educational authorities hope to achieve within a given educational organization by a specific composition of inputs. Equation (1) treats the output as a function of input:

$$(1) \qquad \sum_{i=1}^{11} O = \sum_{i=1}^{11} O(i)$$

The cost model is concerned only with the alternative compositions and the cost of the input side.

Depending upon the point of view of the analyst, there are widely diverging opinions about the meaning of inputs into the educational system, particularly with regard to their qualitative aspects. Viewing the educational system as a macro-economic problem, a global model has, as a first step, to take into account the aggregated items of students, teachers, learning aids, buildings, and material for the maintenance of equipment. This enumeration contains, doubtless, the whole range of "real factors" working in the educational process, but it should be supplemented by an operational description, i.e., a qualitative disaggregation of the different factors.

Four items are considered as factors of input in the cost model presented here: teachers (T), learning aids (L), material for the maintenance of equipment (M), and buildings (B). Students and pupils are not treated as a direct input, because their influence upon the financial requirements is effected indirectly by the amount of other inputs, which depend upon their number. If pupils and students were supported by public scholarships or grants, they would be direct factors of input. But since these forms of aid have until now been of no importance in the school system of the FRG, the input function has been reduced for pragmatic reasons to the four items mentioned above:

$$\sum_{i=1}^{11} I_i = \sum_{i=1}^{11} I_i (T,L,M,B) \tag{2}$$

The only differentiation of inputs is related to the different institutions of the school system ($i = 1,2 \ldots 11$).

The functional relationship between the factors is assumed to be of the fixed coefficient type. The special character of the function will become clearer after an appraisal of the determinants of the factors. From the viewpoint of the decision unit, there are two different types of parameters determining the factors of input invested in the system. There is one type of parameter that cannot, at least in the short term, be influenced by political actions, such as population growth, the autonomous part of the demand for education, and the teacher supply, that is determined by the teacher training activities some time before. On the other hand, decision units can manipulate determinants of input factors such as the quantity of learning aids per pupil or per class, the extent of the maintenance of buildings and almost all of the investment activities. Other parameters can be influenced only partly, e.g., enrolment ratios and, over longer time periods, student/teacher ratios. In the model, only the main variables of the complex environment of the school system have been chosen as determinants of input.

The number of students - differentiated by an institutional disaggregation of the system - is treated as a dependent variable of specific age groups (P) and the according enrolment ratios (r).

$$S_i = S_i (P_i, r_i) \tag{3}$$

In the long run, student numbers are, in conjunction with student/teacher ratios ($\frac{S}{T}$), the determinants of teacher requirements. In the short term, the number of teachers working in the school system is exclusively fixed by the number of teachers already employed and by the past efforts in teacher training, i.e., the teacher supply (TS).

$$T_i = T_i (S_i, (\tfrac{S}{T})_i) \tag{4a}$$

$$T_i = T_i (TS_i) \tag{4b}$$

The total amount of learning aids (L) put into the educational process is seen as a function of the number of classes (C) and a coefficient (a) which indicates the amount of learning aids used per class. By the relation ($\frac{T}{C}$) (teachers per class), the number of classes is related to the supply of, or respectively, the demand for, teachers.

Leaving the problem of the coefficient (a) for later remarks, the following relationships can be formulated:

$$C_i = C_i\left(T_i, \left(\frac{T}{C}\right)_i\right) \tag{5}$$

$$L_i = L_i(C_i, a_i) \tag{6}$$

The material for the maintenance of equipment (M) is related to the number of classrooms (CR), which is treated as representing the stock of investment capital in the school system. b_i denotes the material for the maintenance provided per class. The number of classrooms is, in turn, a function of the number of classes.

$$M_i = M_i(CR_i, b_i) \tag{7}$$

$$CR_i = CR_i\left(C_i, \left(\frac{CR}{C}\right)_i\right) \tag{8}$$

The investments, as the capital input (B) invested in the school system, is subdivided into classrooms (CR), special rooms (SR), and gyms (G).

$$SR_i = SR_i\left(CR_i, \left(\frac{SR}{CR}\right)_i\right) \tag{9}$$

$$G_i = G_i\left(CR_i, \left(\frac{G}{CR}\right)_i\right) \tag{10}$$

$$B_i = B_i(CR_i, SR_i, G_i) \tag{11}$$

These equations show that there is a stringent interdependence between the items of input. If, e.g., the teacher supply is fixed and if it is impossible to change the coefficients $(\frac{T}{C})$, $(\frac{CR}{C})$, $(\frac{SR}{CR})$, $(\frac{G}{CR})$, a, and b, the resource requirements are completely determined. It might be possible to vary these coefficients, but the impact of such a variation on the educational process cannot be assessed in terms of the model. Furthermore, and this is the main characteristic of the school model, there is no substitution between the factors of input.

b. The costs of factors

The model is concerned with public expenditure on schools only, and the analytical value of forecasts produced by the cost model is seriously affected by the exclusion of private expenditures. Even if only 3% of all pupils are attending private schools in the FRG - the outlay of which is covered up to 80-90% by public subsidies - there still remains a wide range for possible substitution of private for public expenditures.

As already mentioned above, pupils are almost completely supported by their families/1/. This means that private opportunity costs, i.e., the income foregone by those remaining at school beyond the age of compulsory education, are not borne by public funds. In some of the Länder, families have also to meet the costs of textbooks and other learning aids.

During the past few years, an increasing part of these private costs has been taken over by public funds, and this trend may well continue. But this interaction between private and public spending could only be considered if sound estimates of the social costs of education were available. The past increases in public expenditures on schools do not, therefore, represent real increases in costs, because, inter alia, part of the increase represents a shift from private expenditure to public funds. Parameters which would imply such shifts are kept constant by the cost model.

It is interesting to note that the exclusive consideration of public expenditure, as is the case in the model, corresponds to the decision level of the budgeting unit. The educational regulator system, however, is concerned with both public and private expenditures. Private educational outlay is one of the main determinants of the individual demand for education. Therefore, it becomes a strategic instrument variable in the educational planning process in which private households play a decisive role.

(i) Expenditure on staff

For estimates of future increases in expenditure on staff, the following equation is used in the model:

$$\Delta A p_i = \Delta A p_i \left(\Delta T_i , \Delta g_i , \Delta s_i \right) \qquad (12)$$

where

ΔAp denotes changes in expenditure on staff,
ΔT denotes changes in the number of teachers,
Δg denotes general increases in the salaries of civil servants, and
Δs denotes changes of teacher salaries caused by variations within the structure of the salary schedules for civil servants.

It should be mentioned that, in the FRG, teachers are civil servants. There is a uniform salary schedule for all civil servants, and its structure is formally related to the qualifications and the functional achievements of civil servants. Hence, teachers' salaries could be used as a financial indicator of the quality of teachers. But during the past few years, a rising teacher shortage has forced the educational authorities to change the salary scales so as to raise teachers' salaries relatively to those of other civil servants. The earlier strong link between the salary and the qualifications and functions of teachers has thus been loosened. Parameter Δs must, therefore, be interpreted in a twofold way - as a financial response to rising teacher shortage and as an improvement in the quality of teachers.

/1/ This is not the case at universities, where 18% of the students get public scholarships or loans.

(ii) Expenditure on learning aids and on the maintenance of equipment

The part of public expenditure on schools treated in the most aggregated way in the model consists of the costs for learning aids and material for maintenance. Mainly due to deficient statistics, these items had to be lumped together as they could not be derived from real input items. The equations assume simple relationships between the number of classes and expenses on learning aids (A_l), and between classrooms and the outlay on the maintenance of equipment (A_m).

$$(13) \qquad \Delta A_{l_i} = \Delta A_{l_i} \, (\Delta C_i \, , \, l_i)$$

$$(14) \qquad \Delta A_{m_i} = \Delta A_{m_i} \, (\Delta CR_i \, , \, m_i)$$

In these equations, unit costs l and m are identical with the coefficients a and b in equations (6) and (7). This means that the unit costs represent the unmeasurable real factors. The interpretation of the coefficient l (and a) has to cover three aspects:

- the amount of learning aids provided per class;
- the quality of these aids;
- the political attitude towards financing textbooks, pencils etc. from public funds, thereby relieving private households of their expenditure for the educational process. Since private expenditure is excluded from the model, the latter aspect cannot be considered in its empirical application.

The quality of learning aids cannot be expressed by coefficient l because this would require an explicit description and disaggregation of this type of input (L). Lack of data does not permit such an operational treatment. Coefficient l expresses, therefore, only the quantity of learning aids per classroom.

Coefficient m (and b) is of a technical character. It can be varied within a certain technically fixed range, because costs of recurring repairs, replacements and improvements of school buildings have not to be met at fixed times, as, e.g., teacher salaries, but can be spread over time. However, these expenditures must be considered as a consequence of earlier expenditure on school buildings and other equipment.

(iii) Capital expenditure

Estimates of future investment expenditure are based on the equation:

$$(15) \qquad \Delta A_{B_i} = \Delta A_{B_i} \, (CR_i \, , SR_i \, , G_i \, , \Delta CR_i \, , \Delta SR_i \, , \Delta G_i \, , \overline{cr_i} \, , \overline{sr_i} \, , \overline{gy_i} \, , c)$$

where

ΔCR, ΔSR, ΔG denote changes in the number of classrooms, special rooms, and gyms resulting from changes in the number of classes or from varied coefficients for physical facilities $\left(\left(\frac{CR}{C}\right)_i , \left(\frac{SR}{CR}\right)_i , \left(\frac{G}{CR}\right)_i \right)$;

$\overline{cr_i}$, $\overline{sr_i}$, $\overline{gy_i}$ denote unit building costs of classrooms, special rooms, and gyms; c denotes the rate of depreciation of the capital stock.

Since the generql assumption is that no changes will take place in the institutional structure of the school system as well as in the regional distribution of student places, c indicates the depreciation caused by wear and tear only.

2. Statistical Results of Alternative Projections of Expenditure on Schools until 1975

Within the framework of this model, a short-term projection until 1970 and a long-term projection until 1975 have been made. The latter considers four alternatives of educational development.

a. For the period 1965 - 1970, expenditure has been assessed on the assumption that all available factors, mainly teacher supply, will be used by the school system. The prospective teacher supply has been computed on the basis of the number of teachers already employed and of the actual number of teacher students[1]. Furthermore, the present class sizes have been taken as constant, and capital outlay has been calculated on the assumption that the targets for school equipment will be achieved by 1970.

With regard to expenditure on staff, two alternatives have been considered:

- the qualification profile of teachers will not change, which implies an unchanged structure of salary scales until 1970 (assumption 1);
- between 1965 and 1970, the qualifications of primary and lower secondary school teachers will be improved, their relative position in the salary scale will improve, and their salaries will rise from 80 to 90% of the salaries of upper secondary school teachers (assumption 2).

Concerning the evolution of prices, the projection assumes an annual increase of total teachers' salaries of 5% (in line with the increase of GNP per head of the labour force). The costs of material inputs will be inflated by 1.5% per annum. The prospective factor supply until 1970, as well as the cost relations for 1965, constitute a relatively firm basis for this short-term projection. The cost relations will probably not change drastically during the projection period.

The empirical outcome shows a moderate increase of expenditure on schools compared with the past, the main reason being the limited availability of factors.

Table 1

Public Expenditure on Schools in the FRG 1960 - 1970 (current prices)

	1960	1965	1970	
Mill. DM	6,190	10,915	17,521	(assumption 1)
			17,851	(assumption 2)
Increase as percentage of spending level five years before		76	61	(assumption 1)
			64	(assumption 2)

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[1] STÄNDIGE KONFERENZ DER KULTUSMINISTER, Lehrerbestand und Lehrerbedarf, Dokumentation 20-24, four volumes, Bonn 1967, 113, 181, 163, 99 p.

b. For the period 1970 - 1975, the factor supply cannot be estimated accurately. There are too many degrees of freedom in the set of determinants which influence this supply. Furthermore, within such a long time period, the cost relations can alter to a large extent. Reasons which might lead to changes in the cost relations are:

- general economic development, especially structural shifts in the labour market and salary relations;
- technical improvements which allow the application of less expensive techniques in schools;
- the use of political instruments, such as teachers' salaries, for regulating the allocation of resources and counteracting the scarcity of specific factors.

Despite these important caveats, the unit costs of 1965, supplemented by annual price increases of 5% for expenditure on staff and 1.5% for expenditure on materials, have been used for alternative projections of expenditure on schools. The outcome of these forecasts must be taken as a first step towards assessing long-term trends of expenditure on schools in the FRG.

The financial implications of the following four alternatives of future factor input into the school system have been worked out for the period 1970 - 1975.

- Alternative 1: with the exception of demographic factors, all items of the school system and their determinants have been held constant.

- Alternative 2: in addition to the demographic development, a linear increase of the demand for education, expressed in terms of rising enrolment ratios, has been assumed.

- Alternatives 3 and 4: the determinants of educational development which are partly shielded from political influence are treated as presuppositions of any desired qualitative improvements of the school system. The conceptions for such improvements have been formulated by a conference of all ministers of education in the FRG/1/. There are two types of targets, which are expressed in terms of pupil/teacher ratios and class-sizes.

The first type is oriented towards educational standards which had been achieved by some progressive Länder in 1963. These standards (alternative student/teacher ratios and class sizes) have been recommended as common targets for the whole of the FRG until 1970. Since the available factor supply does not permit a realization of these targets until the end of this decade, we postponed them until 1975 (alternative 3).

The second type of educational targets, more ambitious than the first, is supposed to provide pedagogically optimal conditions (alternative 4).

/1/ STÄNDIGE KONFERENZ DER KULTUSMINISTER, Bedarfsfeststellung 1961-1970, Dokumentation 6, Stuttgart, Klett Verlag, 1963, 94 p.

Table 2

Expenditure on Public Schools in the FRG
Four alternatives 1975 (current prices)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mill. DM	20 106	21 729	26 845	32 456
Increase as percentage of spending level in 1970 (assumption 2)	13	22	50	82

Alternatives 1 and 2 indicate an increase of expenditure which is lower than that in the past. Improvements according to alternative 3 demand a lower increase of expenditure between 1970 and 1975 as in the period 1965 to 1970. The ambitiously low student/teacher ratio of alternative 4 could only be realized by a greater increase of expenditure than ever before.

3. Discussion of the Model

a. Limitations and built-in uncertainties of the transformation function

In the case of our long-term projection, it is postulated that all the required real factors are available. However a transformation function of the fixed coefficient type is assumed. These assumptions raise a number of questions which are discussed below.

(1) The model does not make it clear how the educational process continues if one factor of input is limited in relation to other factors. It is assumed that the combination of input factors is given by the fixed coefficients of the transformation function. Thus, if there exists a teacher shortage there will be no adaptive reactions of the transformation function to changing challenges to the school system. If the supply of factors is fixed, a rising number of pupils leads to an increase in class sizes only, which does not affect the financial implications. If, furthermore, a maximum criterion for class sizes is introduced the capacity of the system is determined.

(2) One of the weaker points in the model is the definition of costs. The unit costs applied are extracted from financial statistics based on actual expenditures. These expenditures include political objectives as well as organizational constraints. In other words, the unit costs represent all actual "market imperfections". Possibly, they do not represent the costs which would have to be met if the factors were transferred to their second-best use. It is not known to what extent the actual costs deviate from the "opportunity costs" of factors.

(3) Furthermore, costs which would occur as a result of institutional changes in the school system cannot be clearly stated. But there are some factors already incorporated in the given school system which would reappear in every reformed system. This is true, e.g., for teachers and for parts of the capital stock. On the other hand, the transition to a reformed school system would create additional resource requirements. Two problems of this kind are treated in detail below.

b. The rate of depreciation - a strategic variable in educational planning

In terms of the cost model, the rate of depreciation has been treated as an item for the normal wear and tear of school buildings caused by current use and external influences, such as the weather, etc. This rate, which should be denoted here as is the only kind of depreciation if there are no changes in the institutional structure of schools and in the regional distribution of pupil places. This means that the school system is not affected by a regionally unequal demographic development, and that the educational demand will not require a variable regional distribution of educational supply.

Changes in these external influences may result in a demand for further investments as well as in a depreciation of existing school buildings which cannot be used any longer at their location. The latter happens mainly because of migration from the rural areas to the cities and from the cities to the suburbs. This kind of depreciation will be called c_2.

Both rates, c_1 and c_2, are concerned with an institutionally unchanged school system. They only reflect the investment requirements which are affected by special types of external influences. The depreciation of the stock of school buildings becomes a strategic variable if, for political reasons, it is intended to reform a traditionally differentiated school system. For reasons of simplicity we may assume that the targets of such a reform would be certain curriculum needs and equality of educational opportunity. These targets may require comprehensive schools and day schools as well as a new distribution of schools matching the regional structure of educational demand. The implementation of such a reform would make a part of school buildings obselete for educational purposes. This type of depreciation, as a result of political decisions, is called c_3. It can be interpreted as a "technological" kind of depreciation.

The total amount of technological depreciation can be assessed by evaluating each school building, thereby appraising the extent to which it can be utilized in the reformed system. This evaluation would show the amount of school buildings which have to be depreciated for educational purposes at their location and which must be replaced at other locations according to the new educational aims. The rate of depreciation indicates how this replacement will be distributed over future years. The coefficient c_3 is, therefore, a quantitative expression of the political time preference for the transition to the new school system. Besides other constraints concerning this transition process - e.g., the necessary training and retraining of teachers with regard to their new task - there may be a limited capital budget for the school sector. This limitation can be directly translated into a time schedule for the realization of the reform, via c_3. Therefore, c_3 can form part of an overall educational finance plan which does not have to be necessarily broken down into regional sub-units.

c. Financing teacher inputs

It has thus been possible to use our model for estimates of future teacher requirements by a combination of enrolment ratios and student/teacher ratios. This procedure corresponds to the manpower approach which derives the needs of qualified personnel from an assumed rate of economic growth, thereby using specific structural coefficients of the economic system, the labour force, and the rate of labour productivity. But in the same way as the manpower approach, our model offers only information about the amount of these requirements. Long-term determinants on the supply side are not taken into account.

In the case of the FRG, for instance, projections until 1975 show a heavily increasing teacher demand in secondary education (Gymnasium). The teacher supply available until 1970 (it rises by 21% between 1965 and 1970) will lead to a more acute teacher shortage than in 1965. This shortage will probably become even more serious in mathematics and science. Whereas these figures indicate the trend for the whole of the FRG, there is already today a surplus and partial unemployment of secondary school teachers in the city-state of Berlin. Between 1970 and 1975, the demand for upper secondary school teachers will rise by 78% in the FRG (alternative 3). It is an open question how these requirements will be met.

In our model, the future expenditure on staff is assessed on the basis of teacher requirements. Since variations in the structure of teachers' salaries may offer planning instruments for meeting these requirements, we must ask whether the unit costs assumed for teachers take into account possible changes in salaries which might be necessary in the face of a rising teacher demand. In other words, the educational regulator system has to consider possible changes in teachers' salaries as incentives.

Our cost model cannot deal with these problems, because it does not include a model of teacher supply (this model must be connected, inter alia, with the output of the school system) as well as a model which describes the behaviour of the regulator system/1/. With regard to teacher inputs, therefore, our cost model should be enlarged. A number of aspects which are related to this problem are discussed below.

(i) The importance of teachers as an input of the educational transformation function can be summarized in the following way.

- Teachers occupy a key position within the planning structure. They not only impart knowledge - which is, after all, the basic aim of education - but they also test and evaluate the achievements of students and pupils, thus producing the basic data for the evaluation of the educational system.
- Teachers are also agents of change; they find out the needs and possibilities for innovations in education; they can supply the empirical data for investigations into the educational process; and they fulfil the task of implementing educational innovations.
- In order to fulfil these tasks, teachers must keep abreast of new knowledge in a world in which new knowledge accumulates at an increasing speed. They themselves must, therefore, undergo a continuous process of education.
- Lastly, the possibilities of substituting other factors for teachers have until now been very limited.

(ii) The role played by teachers and the corresponding targets of the regulator system affect potentially the financial side of education.

We must assume that the actions and motivations of teachers are at least partly influenced by their income, which should thus be seen as a potential substitute for the prestige and promotion opportunities of the teaching profession. In a

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/1/ A review of different aspects related to teacher shortage has been undertaken by POSCH, Peter, Der Lehrermangel, Weinheim and Berlin, Verlag Julius Betz, 1967, 241 p.

mainly public educational system, promotion opportunities, prestige, and the level of salaries can be manipulated by the regulator system.

Today, teachers' salaries are seldom used as an operational instrument of educational planning. This is true for the FRG, where almost all teachers are civil servants. According to the tradiational legislation, which stems from the 19th century, civil servants' salaries are not supposed to be an economic equivalent for their work; originally, they were meant only to guarantee the subsistence of the civil servant.

However, the present expansion of the educational system and the corresponding teacher requirements call for a more functional treatment of teachers' salaries. Since teachers are part of the labour force, this treatment must be at least partly governed by economic criteria. Several additional determinants of expenditure on staff must, therefore, be introduced.

The recruitment of teachers takes place in competition with the labour requirements of the private sector of the economy and of other public sectors. The level of teachers' salaries must, therefore, be determined by the competitive position of teachers in the labour market. Decisions on teachers' salaries must take into account that teachers can leave the educational system if they can get a higher income in other economic sectors. This alternative, of course, is not offered to all teachers to the same extent. Teachers of mathematics and science might easily receive offers from industry, whereas teachers of primary schools often can only find another occupation after intensive re-training/1/. It would be misleading, however, to conclude that primary school teachers could be given a low pay because they have no alternative to being teachers, as in the long run, the number of candidates for teaching in primary schools will be influenced by the salaries of primary school teachers.

There is also the question of subjects with regard to teacher supply/2/. In the specific case of teachers of mathematics and science, the salary structure can become a strategic instrument for overcoming a notorious shortage: salaries would have to be raised in accordance with scarcity. This "market-oriented" payment of mathematics and science teachers is a consequence of past mistakes.

Today, the rapid industrial development, the intensification of research and steeply rising enrolment ratios in secondary education create a demand for technical and scientific personnel which largely exceeds the available supply. The

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/1/ For an interesting theoretical treatment of these aspects, see BECKER, Gary S., Human Capital - A Theoretical and Empirical Analysis, with Special Reference to Education, New York, NBER, 1964, 187 p.

/2/ Furthermore, the teacher supply has to correspond to the demand for education in the different parts of the country, e.g., teachers must be mobile. Today, the regional distribution of teachers is regulated by administrative decisions. The widespread reluctance of teachers to teach in rural schools and their preference for jobs in the city could also be dealt with by financial compensations.

overall scarcity of mathematics and science teachers cannot be eliminated simply by drawing on scientists in the industrial sector. If we want to avoid in the next generation a shortage of technical and scientific personnel caused by a shortage of the corresponding teachers, other ways of recruiting additional teachers must be found. Since there is little chance of "importing" such teachers into the educational system, the only solution would be to offer specific training in mathematics and science to suitably qualified personnel. From the financial point of view, this would imply additional outlays for further university courses and relatively high incomes foregone by those who already have the opportunity of working as highly-qualified people. If the educational cost of this second profession, including the income foregone, is met from public funds, the expenditure will figure in the accounts of teacher training institutions only. If, on the other hand, the students bear part of the cost, their future salaries as teachers would have to offer a corresponding compensation.

Financial incentives and more functional salary scales must be seen as a future instrument of educational planning. Unit costs per teacher as given in the present statistics represent the actual administrative position of teachers and the political value attached to the salary schemes. In the case of functional salary scales, the present unit cost estimates are no longer valid for the future. Any functional treatment of salaries will raise unit costs, because declining salaries are not possible in growing economies. (Therefore, expenditure on staff assessed in our model projections has to be interpreted as a minimum.)

Sounder cost models can be constructed only after appraising possible functional salary schemes/1/. A cross-section analysis of salaries in non-educational occupations competitive with teaching could yield estimates for market-oriented salary schemes of teachers.

IV. CONCLUDING REMARKS

Our model of expenditure on schools assumes changes in the volume of real inputs over time. The unit costs are treated as being unchanged (they are only inflated by a constant rate). This assumption implies an important limitation of the model, because it cannot be stated that changes in real inputs do not have repercussions upon unit costs. In this sense, our model does not take into consideration that the regulator system can or must change its behaviour to meet certain educational targets. The regulator system may have to use finance as an instrument for manipulating the object system.

Functional adjustments of salary scales to meet an increasing demand for teachers are one example discussed in this context. Such adjustments may lead to changes in the composition as well as in the total volume of educational expenditure.

/1/ For the US scene, an empirical study covering these aspects has been undertaken by
KERSHAW, Joseph A. and McKEAN, Roland N., Teacher Shortages and Salary Schedules, Santa Monica, Rand Corp., Memo. RM 3009-FF, 1962, 231 p.

The realization of educational reforms has certain financial implications. The extent of these implications depends, inter alia, on the specific decisions made by the regulator system. We discussed the case of an educational reform which requires a regional redistribution of buildings. Such reform makes part of the stock of school buildings useless for educational purposes and new buildings must be constructed. We treat this decision as a form of technological depreciation. The rate of this depreciation and the corresponding financial implications depend on the decisions about the length of the implementation period of the educational reform and vice versa.

These enlargements of a cost model design with regard to teachers' salaries and investment outlay cannot be included in the empirical model, because this model is not related to a given programming unit in a given planning structure. In this sense, our cost model can only serve as an accounting scheme of school finance comparable to the functions of national accounts.

We may thus conclude that cost models which do not provide for the possibility of the regulator system applying financing as an instrument for educational planning cannot be treated as "decision models".

In conclusion, we would like to make some general proposals for an adequate role of cost models in educational planning:

- First, cost models for educational planning purposes cannot operate within a vacuum. They must be designed as instruments of decision units with implementation power.

- Second, cost models must be computerised so that alternative estimates can be made on a permanent basis and within a minimum of time.

- Third, cost models cannot be constructed as mere translations of real resources into monetary terms if they should serve as planning tools.

- Finally, in addition to the statistical analysis of past unit costs one has to analyse the determinants which might affect changes in the volume and structure of unit costs in the future.

LE ROLE DES MODÈLES DE COUTS DANS LA PLANIFICATION DE L'ENSEIGNEMENT - LE CAS DE LA RÉPUBLIQUE FÉDÉRALE D'ALLEMAGNE

par Klaus Hüfner et Enno Schmitz (Résumé)

Les modèles de coûts établissent un lien entre les activités d'enseignement et leurs implications économiques. Nous considérons la planification de l'enseignement et la budgétisation des fonds publics comme des processus qui intéressent des unités différentes d'organisation reliées par un réseau de communications. En utilisant le langage de l'analyse des systèmes, nous nous efforçons de présenter une vue globale de la planification de l'enseignement, du processus de budgétisation et des modèles de coûts.

Nous disons du système d'enseignement que c'est un système social complexe susceptible d'être influencé. Son comportement n'est pas fixé à priori, ce qui signifie que les éléments internes du système, ainsi que les systèmes auxquels il est relié, peuvent modifier sa structure de comportement dans le temps.

Le processus de planification de l'enseignement devrait être considéré comme un processus à étapes successives comportant programmation, exécution et évaluation. Ces activités peuvent être réalisées par les mêmes unités d'organisation ou par des unités différentes à un niveau ou à plusieurs niveaux. Tous les éléments et systèmes élémentaires différents du système éducatif sont reliés entre eux par des réseaux d'information. Le système d'information dans son ensemble doit être organisé de telle sorte qu'il contribue au processus de décision. Dans les paragraphes qui suivent, nous considérons quatre formes d'information qui sont importantes pour la mise en oeuvre de la programmation et les activités d'évaluation dans le cadre du processus de planification.

(a) Il nous faut d'abord des informations détaillées concernant les établissements d'enseignement. Jusqu'à récemment, les données fondamentales telles que les taux et pourcentages d'inscription dans les écoles, par régions géographiques et catégories socio-économiques étaient inconnues dans la République Fédérale. Il est évident que nous devons disposer de beaucoup plus de données pour établir le type de processus de planification de l'enseignement que nous avons suggéré ci-dessus.

L'utilisation de modèles de flux permet d'identifier plus aisément les flux d'élèves au sein du système éducatif, le nombre des abandons, des redoublants et des diplômés. En outre, des progrès résulteront de l'amélioration des techniques de simulation par ordinateur, ce qui nous permettra d'abandonner un certain nombre d'hypothèses simplifiées et de concevoir des modèles qui fourniront des informations plus détaillées.

Sur la base de certaines décisions politiques, les services de programmation seront capables de mettre au point des modèles pour procéder à des vérifications de cohérence. Ceci signifie que des objectifs donnés dans l'avenir doivent être exprimés en termes quantitatifs. Les services de programmation devraient être capables de vérifier si les décisions adoptées sont réalisables dans un système donné d'enseignement.

(b) La deuxième catégorie de renseignements doit être rassemblée directement par les services en charge de l'exécution. Ces données consistent en instructions et délégations de pouvoirs de décision aux niveaux inférieurs de la planification.

(c) La troisième série de renseignements est un compte rendu sur l'état de réalisation du système aux fins d'évaluation.

Un modèle destiné à l'évaluation des dépenses scolaires dans la République Fédérale d'Allemagne

La deuxième partie de l'étude est consacrée à l'examen d'un modèle de coûts qui a été conçu pour prévoir la tendance future des dépenses scolaires dans la République Fédérale d'Allemagne. Il faudrait noter, dès à présent, que le modèle ne traite pas tous les problèmes de mesure ou d'évaluation de l'output du système éducatif. Cependant, le modèle est valable pour avoir un jugement à l'égard de diverses options possibles de composition de l'input en vue d'obtenir un output défini.

Les résultats empiriques du modèle sont très agrégés parce qu'il traite le système scolaire de la République Fédérale d'Allemagne comme un système global. En République Fédérale d'Allemagne, les finances publiques dépendent principalement d'une législation fiscale relativement centralisée et de diverses interdépendances entre les budgets du "Bund" (gouvernement fédéral), des "Länder" (Etats) et des "Gemeiden"(Municipalités). Par contre, la responsabilité de l'administration et du financement des écoles est entièrement à la charge des états et des municipalités.

Le modèle a les caractéristiques générales suivantes :

(1) Il est établi sur le plan national non pas par une agrégation des modèles de coûts concernant les sous-unités régionales, mais par des agrégats et des objectifs à l'échelle du pays.

(2) Il ne traite que des établissements actuels d'enseignement. C'est sur la même base que l'on a défini également les coûts. Le modèle ne couvre que les dépenses qui sont à la charge des budgets publics.

(3) En dépit de cette base étroitement définie, le modèle peut offrir un ensemble de concepts qui serviront à discuter les conséquences qu'entraîne le coût des réformes de l'enseignement.

Il nous faut distinguer entre le facteur coût des postes concrets tels que les professeurs, les élèves, les bâtiments, etc. et, d'autre part, les inter-dépendances entre ces postes. Comme aucun modèle structurel du système d'enseignement n'était disponible, il a fallu construire un modèle du système scolaire qui servirait de base au modèle des coûts. Cette élaboration a été réalisée de telle façon que les calculs de coûts soient réalisables en tenant compte des statistiques financières disponibles qui sont relativement pauvres.

Les autres solutions de projection, incorporées au sein du modèle, ne tiennent compte d'aucun changement possible dans les schémas institutionnels. On a pris pour hypothèse générale que l'évolution future de l'enseignement ne serait provoquée que par l'augmentation ultérieure de la population scolaire et des taux d'immatriculation. Ces facteurs qui, de façon relativement autonome, déterminent l'évolution du système éducatif sont traités sur la base de diverses options d'input sous forme de professeurs, de bâtiments et d'équipements divers.

Quatre postes ont été considérés comme constituant des facteurs d'input dans le modèle des coûts : les enseignants, les matériels d'enseignement, le matériel pour l'entretien des équipements et les bâtiments. L'effectif scolaire - réparti selon une désagrégation institutionnelle du système - est traité comme une variable dépendante des groupes d'âge spécifiques et des taux d'immatriculation correspondants à ces groupes. A long terme l'effectif scolaire, tenant compte des ratios professeurs/étudiants, détermine les besoins en professeurs. Dans le court terme, le nombre des professeurs exerçant au sein du système scolaire est exclusivement déterminé par le nombre des professeurs déjà employés et par les efforts accomplis dans le passé pour la formation des professeurs, en d'autres termes : l'offre de professeurs.

Les évaluations de l'augmentation future des dépenses de personnel tiennent compte des changements dans l'effectif du corps enseignant, de l'augmentation générale des salaires des fonctionnaires, et des changements de la masse des salaires des professeurs que provoque la variation de l'échelle des salaires des fonctionnaires.

Les investissements sont divisés en plusieurs postes : salles de classe, salles spécialisées et gymnases. Les évaluations des dépenses d'investissement à l'avenir sont fondées sur les changements à envisager dans les différents types de salles, qui résultent soit de changements dans le nombre des classes, soit de coefficients différents pour les installations d'éducation physique, ainsi que du taux de dépréciation du capital existant.

Dans le cadre du modèle ainsi décrit, une projection à court terme allant jusqu'à 1970 et une projection à long terme jusqu'à 1975 ont été établies.

SYSTEMS ANALYSIS OF ALTERNATIVE DESIGNS OF A FACULTY

by Richard Judy, Jack B. Levine,
Richard Wilson and John Walter

SUMMARY

This paper reports early results of the application of systems analysis to problems of planning in the Faculty of Medicine, University of Toronto.

Analysis is reported of various alternative policies concerning enrolment, curriculum, involvement of teaching, hospitals, teaching loads, and group size. The analysis was conducted with the aid of a computerised simulation model (the JCL3W model). This model is highly modular and very flexible. With minor changes it can be used in other institutions.

Certain problems of accomplishment and implementation are discussed.

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CONTENTS

Summary 252

1. Introduction 254

  1.1. Objectives of this paper 254

  1.2. A Brief Exposition of Systems Analysis 254

  1.3. The Health Science Faculties of the University of Toronto 256

2. The Health Sciences Faculties as a System 257

  2.1. Outputs of the System 257

  2.2. Inputs to the System 257

  2.3. Major Problems Confronting Decision-Makers of the System 259

  2.4. The Need for Analysis 262

3. The JCL3W Model 263

  3.1. Departmental Workloads 263

  3.2. Structure of the JCL3W Model 264

  3.3. Use of the Model's Output 269

4. Problems of Accomplishing and Implementing Systems Analysis in Universities 282

  4.1. Problems of Accomplishment 282

  4.2. Problems of Implementation 283

Footnotes 285

1. INTRODUCTION

1.1. Objectives of This Paper

There are two main objectives of this paper:
(1) To illustrate how systems analysis can aid university planning by means of a case study of a specific university planning situation, and (2) To indicate some of the problems of carrying out such analysis and implementing its results.

1.2. A Brief Exposition of Systems Analysis

The term "systems analysis" gained currency in the early post-World War II period. The name was suggested because analysts were primarily concerned with weapon systems. Studies undertaken to assist military decision-makers to choose from among weapon systems were called "systems analyses".[1]

Later, the idea of "systems analysis" came to connote the antithesis of partial and piecemeal analysis. Analysts were urged to take account of interactions and interdependencies among sub-systems of larger systems.[2]

More recently, the term "systems analysis" has been used almost interchangeably with operations research, management science, and applied economic analysis.

As we understand it, systems analysis means an approach to problems of decision-making which proceeds by ascertaining objectives, determining constraints, elaborating alternatives, and estimating the costs, benefits and risks of feasible alternatives.

First of all, we postulate the existence of a "system" whose behavior we wish to predict or control. What is and what is not considered to be in the system is a determination to be dictated by expediency. In general, the sharing of common purposes or the existence of strong technological interdependence are sufficient reasons for regarding a set of elements as belonging to a system.

Every system has variables (inputs and outputs), and a technology whereby inputs are transformed into outputs. We seek to capture the main interdependencies among important variables by building models of the system.

The most elementary analysis is to explore the relationships among a system's inputs, its technology, and its outputs. In such analysis, algorithmic optimisation and evaluation of alternatives is left to human judgement.

Given the system's technology, we may alter the outputs and record the implications for the inputs required. This may be done for a large number of output combinations; if it is, we will have explored the input consequences for the corresponding set of possible outputs.

Alternatively, we may again retain the technology unchanged but alter the system's inputs and observe the resultant change in the outputs. Finally, it is possible to experiment with alternative technologies by altering features of the system.

TABLE 1

Selected Statistics of Eleven Hospitals Associated with the Faculty of Medicine, University of Toronto

Institution	Type of Hospital	Number of beds as of 31 Dec. 1966	Number of patients admitted in 1966	Number of patient days of care in 1966	Number of paid hours of work in 1966 (millions)	Per cent of paid hours of work devoted to medical education in 1966	Number of medical specialists graduated (excluding doctors) in 1966	Gross Operating Costs in 1966 ($ millions)	Percent of revenue from the OHSC.
Toronto General Hospital	general	1,391	27,116	425,290	7.2	4.8	108	20.7	90
Toronto Western Hospital	general	851	18,556	251,998	4.3	4.8	63	12.4	92
St.Michael's Hospital	general	894	19,154	289,841	4.7	3.8	162	12.2	93
Wellesley Hospital	general	454	6,980	103,339	1.9	6.8	46	5.8	95
Princess Margaret Hospital	Cancer Institute	120	2,677	38,244	1.2	2.3	4	5.4	99
New Mount Sinai Hospital	general	373	10,938	113,257	1.7	5.6	58(a)	5.9	96
Sunnybrook Hospital	general (formerly veterans)	987	n.a.	41,638	0.8	3.6	2	2.5(b)	75(b)
Sick Children's Hospital	Paediatric	848	26,224	234,958	5.2	4.5	61	15.5	94
Clark Institute of Psychiatry	Psychiatric	206	264	12,886	0.4	1.0	n.a.	n.a.	n.a.
Women's College Hospital	general	280	8,088	83,327	1.4	2.4	51	3.8	98
Lyndhurst Lodge Hospital	spinal rehabilitation	50	195	17,543	0.2	0.1	n.a.	0.5	75
Total		6,554	120,192	1,612,321	29.0			(84.7)	

a. Includes Nightingale School of Nursing

b. From October 1, 1966 only.

Source: Ontario Hospital Services Commission. 1966 Annual Report, (Statistical Supplement), Toronto, 1967.

This relatively elementary analysis may be very useful. Decision-makers often lack the most elementary input-output information and the systems analyst may perform a useful function by providing it. The analyst's first task is to build a good model. He then develops or solicits from decision-makers alternative sets of outputs and uses the model to compute their input implications. He may also alter coefficients of his model in ways corresponding to alternative policies and technological designs.

The value of this type of input-output analysis is that it allows university decision-makers to ask "What if . . . . ?" questions. When confronted with a problem, the decision-makers can explore the implications of many possible decision alternatives. Information about the resource implications of each alternative can be computed and displayed quickly. The final choice from among available alternatives can be preceded by sequential interaction between decision-makers (or their analysts) and the model.

The case study reported here is intended to illustrate how sequential interaction is proceeding between decision-makers and computer-assisted analysis at the University of Toronto.

1.3. The Health Science Faculties of the University of Toronto

The systems analysis described in this paper is being conducted in support of planning for the health sciences faculties of the University of Toronto. These eight faculties, schools, and departments constitute the domain of the Vice-President, Health Sciences.[3]

Because most of the work to date has concerned the Faculty of Medicine, the bulk of this paper is directed towards that Faculty.

The Faculty of Medicine consists of 19 departments.[4] Associated with the Faculty of Medicine are eleven hospitals where clinical instruction is given to undergraduate medical students in the fourth, third, and part of the second medical years.[5] Graduate training and research are also conducted. Each of these hospitals, except for Sunnybrook, is governed by its own board of trustees. (Sunnybrook, formerly a veterans' hospital, was presented to the University of Toronto on October 1, 1966.) Most of the hospitals are located in close proximity to the main campus of the University of Toronto.[6] Basic data describing the eleven hospitals is provided in Table 1.

The association of the University and the Toronto General Hospital is defined by the Toronto General Hospital Act. This Act specifies that the professor and head of each university department is entitled to a service in the Toronto General Hospital. An amendment to this Act specifies that there shall be only service in medicine and surgery; the professor of these departments is by inference the Chief of Service at the Hospital. The remaining heads of clinical departments are also chiefs of service of their respective divisions at the Toronto General Hospital, except for the Department of Paediatrics (Hospital for Sick Children) and the Department of Psychiatry (The Clark Institute). The relationship of the University to the other teaching hospitals and the mechanism of appointments of chiefs of service is not defined by formal agreement.

2. THE HEALTH SCIENCES FACULTIES AS A SYSTEM

We choose to regard the health sciences faculties with all their faculties, departments, and associated hospitals as a system. It is a complex system with multiple inputs and outputs. Distinguishing between inputs and outputs is often difficult. A symbiosis among instruction, research and service create problems of joint outputs. A multiple goal structure is determined by the organisational autonomy of the teaching hospitals and the clinical departments. Our objective is to employ systems analysis to improve the planning and operation of this system.

2.1. Outputs of the System

Without reference to objectives, it is impossible to distinguish inputs from outputs. Because we are dealing with multiple objective functions, there may be no general agreement on what belongs on the input side of the ledger and what constitutes the outputs./7/ We skirt this issue here and simply list those things which are regarded as outputs by some objective function operating in the system.

2.1.1. Education of health science personnel

A major objective of the University is the education of health science personnel. This means, presumably, addition to the stocks of knowledge and skill of this set of people. Measurement of these stocks and increments thereto is very difficult. Discussion of problems of measuring outputs is deferred until section 4.3; until then, the question is begged by treating the number of students processed through the system as an index of output.

Educational outputs may be grouped into four groups: (1) Undergraduate education of students of Medicine and the other faculties, (2) Graduate training in the basic sciences, (3) Career training of clinical specialists, and (4) Continuing medical education. The levels of undergraduate educational activities are displayed in Table 2.

2.1.2. Patient care

The eleven hospitals associated with the Faculty of Medicine contain more than 6,500 beds. In 1966, 120,192 patients were admitted for treatment and the number of patient days of care numbered 1,612,321.

2.1.3. Research

Research is recognised as an important independent objective of the health science faculties. In addition, research facilities are regarded as a means of attracting and retaining staff of high calibre./8/

2.2. Inputs to the System

A variety of inputs flow into the system. What appears as inputs to some may seem to be outputs to others; for example, patient care appears to the University as an input to the teaching and research processes while it seems to be an important output to the associated hospitals. Avoiding such difficulties, we proceed to list a number of the inputs to the system.

TABLE 2

Undergraduate Enrolment in Medicine

University of Toronto, 1949/50 - 1966/67

	First year	Second year	Third year	Fourth year
1949/50	165	-	-	-
1950/51	164	158	-	-
1951/52	156	152	169	-
1952/53	157	149	162	170
1953/54	150	150	155	160
1954/55	131	146	154	152
1955/56	163	125	145	151
1956/57	149	151	124	140
1957/58	161	149	147	123
1958/59	168	153	140	147
1959/60	154	158	148	144
1960/61	149	152	152	146
1961/62	152	144	148	150
1962/63	175	143	133	147
1963/64	161	166	129	133
1964/65	176	147	159	127
1965/66	161	182	134	157
1966/67	155	177	181	133
1967/68*	160	178	168	179
1968/69*	160	183	169	166
1969/70*	225	183	173	167
1970/71*	225	247	173	171
1971/72*	225	247	234	171
1972/73*	225	247	234	232

Source: J.W. Steiner, K. Arakawa, M.L. Chipman, and G.C. Crawford; Studies on Medical Education, 1947-1966, University of Tororto (Mimeograph), 1966, pp. 147-159. Presidents Report, University of Toronto, 1966.

* Projected

2.2.1. Uneducated or partially educated individuals

Students at all stages of their training invest their time in the health education process. A student at the beginning of year t makes the input of one man-year and arrives at year t + 1 with his stock of knowledge increased. The physical input is the student's time and part of the social opportunity cost of that input is the value of alternative employment that he might have had were he not in school.

2.2.2. Academic and non-academic staff

Faculty, residents, demonstrators, technicians, and other specialists contribute their services to the health science education and research processes.

2.2.3. Facilities and materials

The most varied kinds of facilities and materials are used by the system. Lecture halls, seminar rooms, theatre clinics, study spaces, library facilities, laboratories, offices, eating facilities, living quarters, television equipment, and animals are but a few of the facilities and materials used in the teaching and research process. In some cases, materials are consumed in the process of use; in others, the input is reckoned in units of capacity per time interval.

2.2.4. Patients

Health science students must be exposed to normal and abnormal patients in all age groups and of both sexes. They must see patients undergoing acute and chronic care including convalescent and ambulatory care. To adequately provide for clinical research, there must be a plentiful supply of normal and abnormal patients. Both teaching and research require the input of patient "services".

This list of inputs could be extended but enough items have been enumerated to indicate the main categories into which inputs are classified. No mention has been made of money because of a desire to concentrate attention on the physical resources which are input into the system. Money, as generalised purchasing power, is command over physical inputs of diverse types. Our approach is to deal first with resources in physical units and to convert to monetary units afterwards. Furthermore, the appropriate valuations to be placed on many systems inputs often are not to be found in the market-place; some more subtle definitions and estimations of real opportunity costs are necessary.

2.3. Major Problems Confronting Decision Makers of the System

A number of major problems now confront decision-makers in the University of Toronto health sciences system.

2.3.1. Expansion of enrolment in medicine

The first major problem arises from a planned expansion of the undergraduate medical program. In 1964, after considering alternative ways of increasing the number of medical specialists, a special committee of the University's Board of Governors recommended an expansion of the medical faculty to accommodate 250 students in the entering class rather than approximately 175 accepted at the present time. /9/ The increased enrolment is to be handled by an expansion of the existing basic science departments on the main University campus and by expansion of the activities at each of the major affiliated teaching hospitals.

The Committee anticipated substantial economies of scale as a result of the enlargement of the proposed facilities on campus and at the teaching hospitals. It estimated that those economies would be substantial when compared to the cost of constructing comparable facilities in a new university medical centre for an equivalent number of students. The Committee anticipated that the increased number of graduates would be turned out three to four years earlier than from an independently developed new medical school. Furthermore, it was expected that academic staff might be recruited more readily into the existing framework of the well recognised Faculty of Medicine than to a new school.[10]

The Board of Governors Special Committee recognised that the enlargement of the entering class to 250 students posed special problems for maintaining and raising standards of education in the Faculty. It reasoned that the main difficulty would be experienced in the clinical training of medical students. But the Committee delivered the opinion that: "If the clinical departments can be developed to a uniformly high standard at three or more major teaching hospitals, clinical instruction of 250 students per class could be satisfactorily handled by sub-dividing classes into three or more smaller groups each affiliated with one teaching hospital."[11]

2.3.2. Curriculum changes

Early in 1967, after several years of discussion, the Faculty of Medicine agreed in principle to a basic re-design of the undergraduate medical curriculum.[12]

The Curriculum Committee's basic recommendation was that: "the Faculty conduct a co-operative experiment in correlated system-oriented teaching." This recommendation, spelled out in more detail in the Committee's Proposed Plan, reflected considerable dissatisfaction with the traditional curriculum based upon the conventional departmental divisions (i.e. Anatomy, Surgery, Medicine, etc.). The organisation of instruction by human physiological systems was expected to facilitate the teaching of basic science, patho-physiology and clinical aspects of patient care by teachers with common interests but with differing points of view.

The Curriculum Committee proposed that the curriculum should be structured on the basis of the following three inter-related periods of study:

Period I - Normal biology of man
Period II - Disease in terms of altered human biology
Period III - Patients in relation to altered biological processes.

Period I would be spent largely on campus, Period II partly on campus and partly in teaching hospitals, and Period III largely in teaching hospitals.

Beyond this parcelling into periods and some general recommendations about the organisation of each period, the Curriculum Committee did not go. In particular, it did not attempt to specify particular lectures, seminars, laboratories, etc., their times or places, their sizes or topics, or even the number of students who would participate in each of the teaching hospitals during Periods II and III. The responsibility for detailed curriculum planning was delegated to a Committee of the Heads of Departments. This Committee was empowered to appoint a "period committee" for each of the three curricular periods. Each period committee consists of:

(1) a period coordinator
(2) Chairmen representing each system and/or departmental discipline being taught in the period.

Each period committee is charged to:

(1) plan the curriculum and examinations in its period: and
(2) submit the plans for approval to the Committee of the Heads of Department.

2.3.3. Increase in research

The Special Committee of the Board of Governors, in its 1964 Report, recommended a major expansion of the level of research in the Faculty of Medicine. Its reasons for this recommendation were threefold:

(1) Increased medical knowledge is a good thing and, therefore, medical research is an independent and autonomous objective to be pursued.

(2) The scope of medical knowledge is so great that only by being involved in research can a medical teacher maintain the high quality of his teaching.

(3) To attrach and retain high calibre staff it is necessary to offer good research facilities and create an atmosphere conducive to continuing academic achievement.

The first of these reasons is autonomous while the second and third are induced by a concern for achieving the instructional objective.

2.3.4. Expansion of graduate studies

The need to produce physician-scientists and future teachers was considered by the Special Committee of the Board of Governors to warrent considerable expansion in graduate studies. This includes M.A. and Ph.D. Studies, career training of clinical specialists, and continuing medical education.

The training of clinical specialists has formerly been a hospital rather than a University responsibility even though Faculty staff members were involved. It is now proposed that the University's Faculty of Medicine assume explicit financial and academic responsibility for the education, training and supervision of interns and residents.

2.3.5. Roles of various teaching hospitals

Eleven hospitals now participate in the teaching program of the Faculty of Medicine; seven have a major involvement. Such broad participation carries advantages and disadvantages. On the one hand, students are exposed to a greater volume and variety of clinical materials. On the other, greater dispersion raises problems of quality control, scheduling and diseconomies of scale.

A major problem for the University is to determine the proper role for each of the affiliated teaching hospitals. The problem is aggravated by the fact that each hospital, quite naturally, wishes to maximise the significance of its own role in the system. Several have independently developed plans for expensive new clinical and research facilities. Evidently, the cost of independent, ambitious, capital investment plans replicated by several hospitals would be very expensive.

Government funding agencies are unwilling to finance the high capital and operating costs of excessive duplication. Requests for hundreds of millions of dollars of capital grants already have been made by teaching hospitals to support their self-conceived roles in the expanded University medical program. Government has asked the University to scrutinise these plans and certify that they are necessary to meet its needs. Failure of the University to adequately discharge this obligation could lead to an unfortunate reduction in its autonomy.

2.3.6. Staffing and remuneration policy

The departments of the Faculty of Medicine and the other health sciences faculties employ staff members who provide services of instruction, service, research and administration to the system. Changes in the levels and mixes of the main system outputs carry implications for staff resources.

At the present time, the Faculty of Medicine depends heavily on (1) staff members paid partly from the University budget and partly by granting agencies outside the University and (2) staff in the clinical departments who receive little financial or academic recognition from the University. This latter group consists largely of clinical practitioners who, at least in the past, derived some advantage from their association with the teaching hospitals.[13]

There is a concern that the existing staff mix of teacher-practitioners is an unsteady base for the desired quantitative and qualitative expansion of the Faculty. Teaching may be given a residual priority by a teacher-practitioner who is very busy with his private practice. The desired development of research in the Faculty is inconsistent with a staff mix favouring teacher-practitioners; research demands teacher-researchers. Finally, the Faculty may be unable to attract enough staff members of high calibre if it relies on part-time teacher-practitioners.

For these reasons, a shift in the composition of the Faculty staff is contemplated. The proposal is to shift the staff mix of the clinical departments in the direction of full-time teacher-practitioner-researchers.[14] This will have important implications for the research facilities that the Faculty must provide. The existence of an active market for skilled medical personnel must be recognised.

2.4. The Need for Analysis

From this brief survey of six major decision areas confronting leaders of the Faculty of Medicine, the need for analytical staff work is apparent. Early in 1967, the Health Sciences Functional Planning Unit was formed with financial assistance from the Federal and Ontario governments. The Unit is placed organisationally under the Vice President, Health Sciences. Its mission is to develop and apply system analytical techniques to assist policy planning in the Health Sciences.

A principal objective of the Unit is to develop models with which quantitatively to assess the resource implications of alternative plans and programs. The next section describes one of several models that are now operational.[15]

3. THE JCL3W MODEL

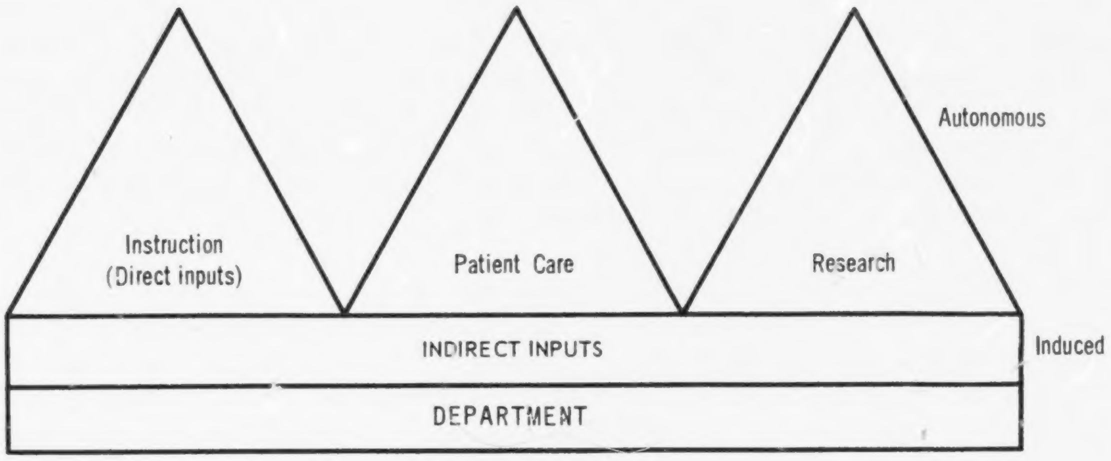
The JCL3W model accepts technological descriptions of the system (or component sub-systems) and output levels; it proceeds to compute the quantities of inputs "required" to produce the outputs.

3.1. Departmental Workloads

Because the departments provide most of the inputs to the health science system, the JCL3W model was designed to compute the input resource requirements at the departmental level of detail. The loads upon a department may emanate from several different sources as illustrated in Figure 1.

Figure 1

DEVELOPMENT OF LOADS ON A DEPARTMENT



3.1.1. First is the load generated by the teaching function itself. This is handled by decomposing each curriculum into basic modules called "activities" in such a manner that certain direct input requirements can be associated with a "unit" of that activity. Direct input resource requirements are things such as academic staff, lecture halls, seminar rooms, patients, etc.

3.1.2. Induced resource requirements result from the necessity to support and sustain the academic system. They can be viewed as "induced" by the existence of students in the system. Of these, administrative requirements are relatively obvious. Service (i.e., patient care) is necessary in order to have patients available as an input for the medical educational system. Well equipped research units are thought to be necessary to attract and retain qualified academic personnel. All of these place loads on the typical department in addition to, and as the result of, the teaching function.

3.1.3. Autonomous resource requirements are those which are necessary whether or not a teaching function is performed. Patient care is an autonomous objective. For example, some research activity is independent of the number of students present in the system.

3.2. Structure of the JCL3W Model/16/

The basic building block of the JCL3W model is the "activity". An activity is one unit (usually one hour) of a literal activity (e.g., pathology lecture, surgery seminar) involving a group of students and a set of input resources. All academic activities which engage health science students are described according to type, size of student group involved, and specifications of inputs required to carry out the unit level of the activity (including the type of input, the department from which it comes, the cost-centre to which the input is to be dedicated, and a code denoting the nature of the functional relationship between the activity and inputs required per unit level). Figure 2 displays the Activity Record Sheet on which this information is recorded.

Activities are combined into sets called curricula. Each curriculum is compiled by assembling activities and indicating the fraction of the class to be engaged in this activity and the number of hours per week that each activity is to operate. Figure 3 displays the Curriculum Recording Sheet used to collect the curriculum specifications.

Students are "moved" through the system from state to state. Some leave the system, other drop out and re-enter, others proceed directly through the system to graduation. As they are moved through the system by the program, they engage in activities as directed by the curricula. The types and levels of activities generate input requirements. These are dumped onto magnetic tape from which they may be arranged in thousands of possible combinations by the Report Generator./17/

The model can handle time units of flexible length in a series of up to 65 units (five years if each unit is four weeks in length; somewhat more than one year if units are a single week). A typical five-year case for the Faculty of Medicine might involve 18 different curricula, 250 unique activities, 29 resource codes and 152 cost-dedication centres on the campus and in the teaching hospitals. About five minutes time on the IBM-7094II is required per run. Figure 4 displays the flow by which the JCL3W model takes the Activity Records, Curriculum Records, and other input information and produces the reports on input requirements by institution and/or department for each input type.

The Faculty of Medicine inputs currently being calculated directly by the simulation programs are the following:

Staff (Faculty of Medicine staff, resident staff, demonstrators, other non-university staff)
Patients and Supplies (ambulatory patients, hospitalised patients, autopsy patients, biological specimens, neurological specimens, newborn babies)
Space (lecture rooms, didactic labs, elective research space, sit-down round rooms)

Two of the particular resources, academic staff and lecture rooms, are decomposed by type of teaching activity (for the academic staff) and by number of student stations (for lecture rooms). This direct resource list can easily be modified or extended.

Fig. 2

ACTIVITY RECORD SHEET

(Revision 1, June, 1967)

Description of Activity Bed-Side Clinic, Medicine

Card Code		1 2	0 7
Sequence Number		3	1
(2 Blank Spaces)		4 5	
Activity Code (A)		6 7 8	0 0 1
Activity Type (B)	Bed-side clinic	9 10	0 5
Maximum Group Size		11 12 13	1 0
Desired Group Size		14 15 16	1
(3 Blank Spaces)		17 18 19	
First (Fourth, Seventh) Resource			
(2 Blank Spaces)		20 21	
Department (C)	Medicine	22 23	0 7
Resource Code (D)	Lecturer	24 25 26	0 1
Dedication Level (E)	University & Dept.	27 28	0 1
Proportional Unit (F)	One per group	29 30	0 2
Quantity		31 32 33 34 35 36	1 0
Second (Fifth, Eighth) Resource			
(2 Blank Spaces)		37 38	
Department (C)	Medicine	39 40	0 7
Resource Code (D)	Patient, hospitalized	41 42 43	1 1
Dedication Level (E)	Institution & Dept.	44 45	0 3
Proportional Unit (F)	One per group	46 47	0 2
Quantity		48 49 50 51 52 53	1 0

Fig. 3

CURRICULUM RECORDING SHEET

(Revision 1, June, 1967)

Card Code	1 2	0 6				
3 Blanks	3 4 5					
Faculty	6 7	1				
Curriculum Number	8 9 10	0 1 3	Fourth Year Med (66-7)			
Activity Code	11 12 13	0 0 1	Bed-side Clinic, Medicine			
Hours per Week	14 15 16	8				
Sequence Number	17			47		
Institution	18 19	0 7	TGH	48 49	1 1	NMS
Percent of Class	20 21	6 0		50 51	1 0	
Other Faculty*	22	2		52	2	
One Blank	23			53		
Institution	24 25	0 8	TWH	54 55		
Percent of Class	26 27	1 5		56 57		
Other Faculty	28	2		58		
One Blank	29			59		
Institution	30 31	0 9	SMH	60 61		
Percent of Class	32 33	1 5		62 63		
Other Faculty	34	2		64		
One Blank	35			65		
Institution	36 37	1 0	wei	66 67		
Percent of Class	38 39	1 0		68 69		
Other Faculty	40	2		70		

Fig. 4

STRUCTURE OF THE HEALTH SCIENCES JCL3W MODEL

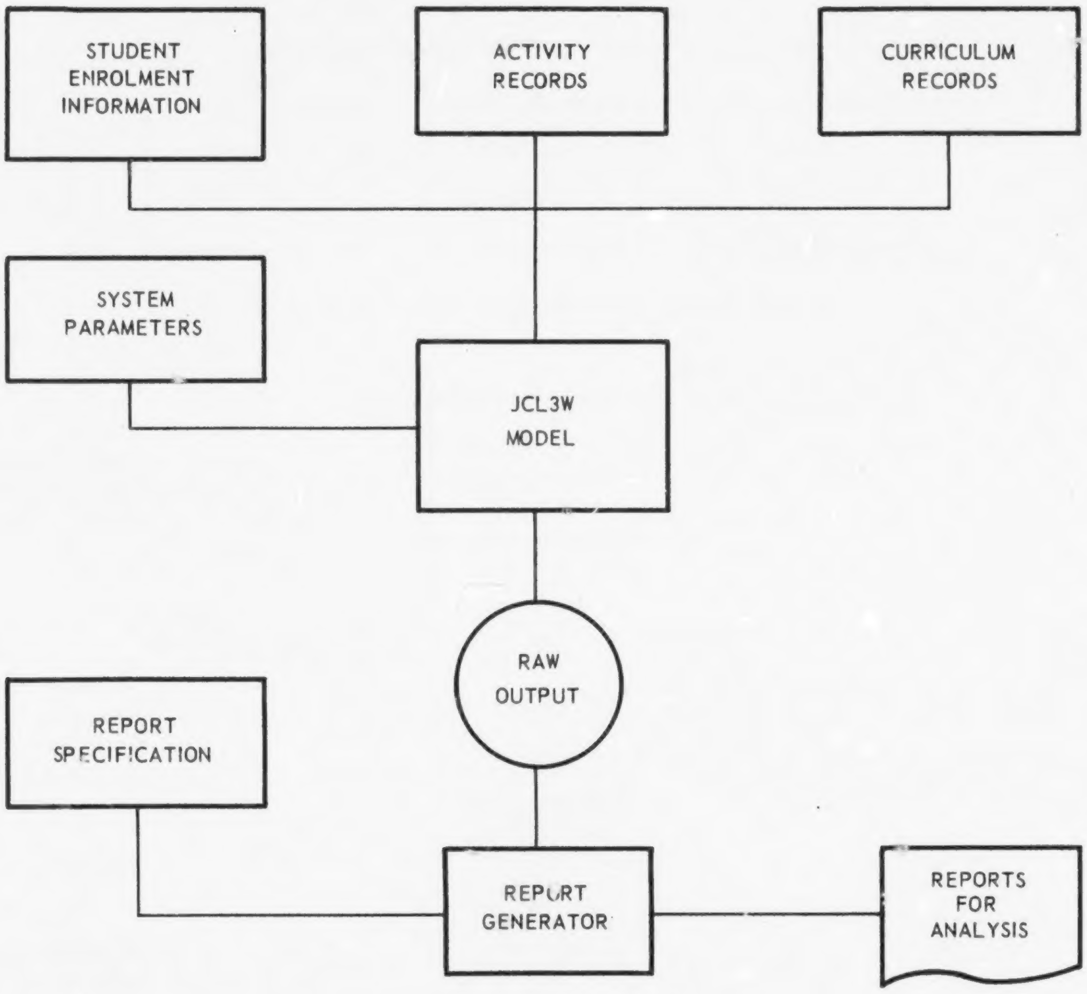
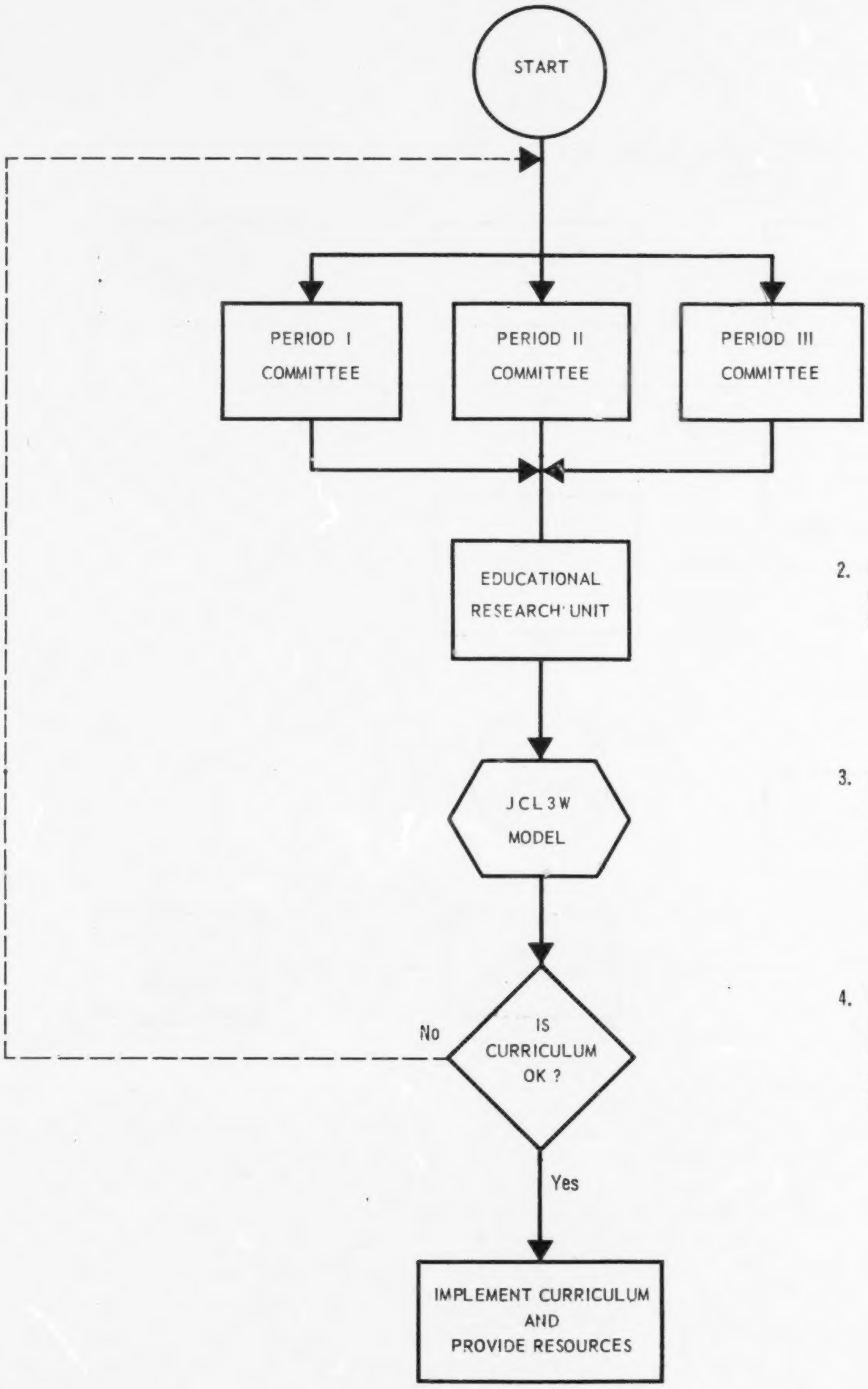

STUDENT ENROLMENT INFORMATION
ACTIVITY RECORDS
CURRICULUM RECORDS
SYSTEM PARAMETERS
JCL3W MODEL
RAW OUTPUT
REPORT SPECIFICATION
REPORT GENERATOR
REPORTS FOR ANALYSIS

Figure 5

UNIVERSITY OF TORONTO
FACULTY OF MEDICINE
FLOW OF INFORMATION IN CURRICULUM PLANNING


START
PERIOD I COMMITTEE
PERIOD II COMMITTEE
PERIOD III COMMITTEE
EDUCATIONAL RESEARCH UNIT
JCL3W MODEL
IS CURRICULUM OK ?
No
Yes
IMPLEMENT CURRICULUM AND PROVIDE RESOURCES

1. The three systems committees generate a curriculum
2. Curriculum is specified in detail and checked for timetable feasibility
3. Resource input requirements estimated. These estimates retained in case curriculum is approved
4. Pedagogic benefits and resource input requirements evaluated by Curriculum Committee Departmental Chairmen and Faculty Council

3.3. Use of the Model's Output

A great value of computerised input-output models for health sciences planners is the ease with which they permit comparative evaluations between alternative plans and programs. Such comparisons, in the detail available from the JCL3W model and its reports, can illuminate the input-output implications of alternative policies or plans under consideration. This interaction between computer-aided analysis and health sciences decision-makers trying out new alternatives produces an interactive sequence that, hopefully, leads to improved decisions.

The Health Sciences Functional Planning Unit is working closely with the curriculum period committees described above to assess resource requirements under various proposals being considered for the new curriculum, enrollment expansion and hospital involvement in this expansion. Figure 5 displays the flow of information among these groups. Proposed syllabi are generated in the Systems and Topics committees. These are reconciled and coordinated for each period by the Period Committees. Singularly or jointly, the proposed period curricula are:

(1) Tested for timetable feasibility and (2) Submitted to the Health Sciences Functional Planning Unit for an estimate of their resource input requirements.

Reports on resource requirements go back to the Period Committees and to the Curriculum Committee fur further consideration. This interaction between the curriculum planners and the analysts has continued since late in 1967.

We now proceed to illustrate, using simple analyses, how the JCL3W model is being used to evaluate the impact of proposed changes. The illustration corresponds to the major problems enumerated in section 2.3 above. Examining first the effect only of expanded enrolment, we add successive levels of complication by introducing variation in curriculum, class size, number of teaching hospitals, etc. The combined effect of all these factors operating simultaneously is of prime interest to the deicsion makers but it is difficult to display in a few pages.

3.3.1. Scale effects

Table 3 illustrates the effect of pure scale expansion. All other factors remain unchanged (curriculum, distribution of students among teaching hospitals, etc.) but enrolment has been increased from 175 to 250 students per class./18/ The impact is shown for two clinical departments (Medicine and Surgery), all clinical departments, all basic science departments, and for the entire Faculty. The implications for two resources are shown, viz., (1) Academic staff contact hours per year and (2) Hospitalised patient contact hours per year.

With a 43% increase in enrolment, the total academic staff contact hours would increase by 40% and the required hospitalised patient contact hours would rise by 43%. In the clinical departments, where small group teaching prevails, the requirements for both resources increase in almost direct proportion to the increase in the number of students. But in the basic science departments, the requirement for academic staff contact hours would increase by only 20%. This reflects the fact that many classes in these departments are of the lecture type where the group size can be increased.

Table 3

Effect on Two Resources of Scale Expansion from 175 to 250 Students per Class,(1) All Other Factors Unchanged.(2)

	Academic staff Contact Hours per year		Hospitalised Patient Contact Hours per year	
	(1) 175 students per year	(2) 250 students per year	(3) 175 students per year	(4) 250 students per year
1. Dept. of Medicine	10,785	15,772	40,306	57,642
2. Dept. of Surgery	7,662	10,294	29,257	41,449
3. All Clinical departments	39,075	56,558	102,052	145,964
4. All Basic Service departments	10,168	12,276	-	-
5. Total for entire Faculty of Medicine	49,243	68,834	102,052	145,964

(1) Assuming 225 students in first year, 250 students in the last three years.

(2) The curriculum is as it was in 1967-68. The distribution of students among eleven teaching hospitals is as it was in 1966-67.

Because the great bulk of academic contact hours devoted to undergraduate medical instruction is provided by the clinical departments where requirements increase in direct proportion to the number of students, the economies of scale in these two resources are not appreciable.

3.3.2. Effects of curriculum change

The proposed change from a "departmental" to a "systems" curriculum was generally described in section 2.3.2. During the last half of 1967 a detailed new curriculum was drawn up by the various period committees. The result of this work was submitted to the Health Sciences Functional Planning Unit for an assessment of its resource implications.

Detailed computations of requirements were made by the JCL3W models for all departments and all teaching hospitals. Table 4 is an example of the kind of detailed computer report that was produced. It shows weekly hours of requirements for lecture rooms of various size in the Banting Institute during the first fifteen weeks of the academic year 1972/73. Table 5 provides summary information on patient requirements.

Table 6 displays the impact of changing the curriculum on academic staff and hospitalised patients. With 250 students per class, the proposed systems curriculum would require about 85% more academic staff contact hours for the entire Faculty. In the clinical departments, the requirement for academic staff contact hours would be about twice as large with the proposed systems curriculum as with the departmental curriculum. Total requirements for hospitalised patients would be less than 10% more under the systems curriculum.

To assess the impact of a curriculum upon the departments, it is necessary to study the time-phasing of the load. Figures 6 and 7 show computer-prepared Calcomp plots of the weekly requirements for academic staff and all staff contact hours that would be generated by the new systems curriculum with 250 students. The load of the Department of Medicine shows strong peaking whereas it is much more evently distributed in the Department of Anaesthesia.

3.3.3. Combined effects of scale increase and curriculum change

Table 7 shows a summary of some of the combined effects of (1) a scale increase from 175 to 250 students per class and (2) changing from the existing departmental curriculum to the proposed systems curriculum. In addition, Table 7 reflects a redistribution of students among teaching hospitals.

The proposed program (250 students, systems curriculum) would require about 150% more academic staff contact hours than the existing situation (175 students, departmental curriculum). The increase would be considerably greater in the clinical departments. For contact hours with hospitalised patients, the proposed program would involve an increase of about 50%.

Table 4

```
                     HEALTH SCIENCES FUNCTIONAL PLANNING UNIT

BREAKDOWN REPORT TABLE FOR LECT.ROOMS                OUTPUT IN HOURS PER SIMULATION PERIOD

REPORT BY SIMULATION PERIODS
                          1972/73 WEEKS( 1-35)    RUN NO.55  ALL PERIODS WK-BY-WK NEW CURRICULUM
                                                     GROUP RULE 2      2  50 STUDENTS
FACULTY OF MED

INSTITUTION BANT.INST

DEPARTMENT OF UNSPEC.DEPT


                 (1-10)     (11-20)     (21-40)     (41-85)     (86-140)     (140- )

          1        230           4           0           0            0          10
          2        230           4           0           0            0          10
          3        230           4           0           0            0          10
          4        230           4           0           0            0          10
          5         60          96           0           0            0          15
          6          0          27           0           0            0          43
          7          0          27           0           0            0          43
          8          0          27           0           0            0          43
          9        111           0          55           0            0           2
         10        128          31          62           0            0           0
         11        263          67           0           0            0           0
         12        263          67           0           0            0           0
         13        263          67           0           0            0           0
         14          0           8           0           0            0          10
         15          0           8           0           0            0          10
```

Table 5

```
                         HEALTH SCIENCES FUNCTIONAL PLANNING UNIT
                         ----------------------------------------

REPORT TABLE FOR PATIENT REQUIREMENTS                OUTPUT IN HOURS PER SIMULATION PERIOD
-------------------------------------

TOTALS FOR SIMULATION PERIODS  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20
-----------------------------  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35
                            1972/73 WEEKS( 1-35)        RUN NO.58  PROPOSED U OF T CURR.  ACT. 1 CURR. 3
                                                                              250 STUDENTS
FACULTY OF MED
--------------------

TOTALS PER DEPARTMENT OVER INSTITUTIONS. MED.BUILD    BANT.INST   T.W.H     S.M.H
WELLESLEY    N.M.S.H      H.S.C.        SUNNYBROOK   W.C.H.      P.M.H.
-------------------------------------------------

                         AMB.PAT     HOSP.PAT    SPECIAL PAT
          IMMUNOLOGY        0.00      1242.00       0.00
          MEDICINE      18199.10     52691.70       0.00
          OBST.-GYN.     8399.80     18517.70       0.00
          OPTHAL.        6237.00      4323.00       0.00
          OTO-LARYN      5220.50      7917.30       0.00
          PAEDIATRICS    8600.80     22693.20       0.00
          PSYCHIATRY     8504.90      9336.80       0.00
          SURGERY       23052.20     39221.10       0.00
          UNSP. CL. DE   1205.70      2009.80       0.00
```

Table 6

Effect on Two Resources of Curriculum Change with 250 Students Per Class.(1)

	Academic Staff Contact Hours per year (250 students per class)		Hospitalised Patient Contact Hours per year (250 students per class)	
	(1) Departmental Curriculum	(2) Systems Curriculum	(3) Departmental Curriculum	(4) Systems Curriculum
1. Dept. of Medicine	15,080	31,903	57,400	52,691
2. Dept. of Surgery	10,328	30,185	41,384	39,221
3. All Clinical departments	53,952	111,011	145,376	157,953
4. All Basic Science departments	12,744	13,114	-	-
5. Total for entire Faculty of Medicine	66,696	124,125	145,376	157,953

(1) Assuming 225 students in first year, 250 students

Students were distributed among hospitals as follows:

Period I - 100% in Medical Science and Anatomy buildings.
Period II
and III - 23% at Toronto General Hospital
23% at Sunnybrook Hospital
15% at Toronto Western Hospital
15% at St. Michael's Hospital.
Remainder divided equally among New Mt. Sinai, Wellesley, and Women's College hospitals.

Fig. 6

HEALTH SCIENCES FUNCTIONAL PLANNING UNIT

WK-BY-WK CONTACT HOURS FOR ACAD. STAFF AND ALL STAFF
DEPARTMENT OF MEDICINE IN ALL INSTITUTIONS

CASE 54 IDEAL U. OF T. SYSTEM CURRIC. (15 JAN. 68) ALL PERIODS 250 STUDENTS

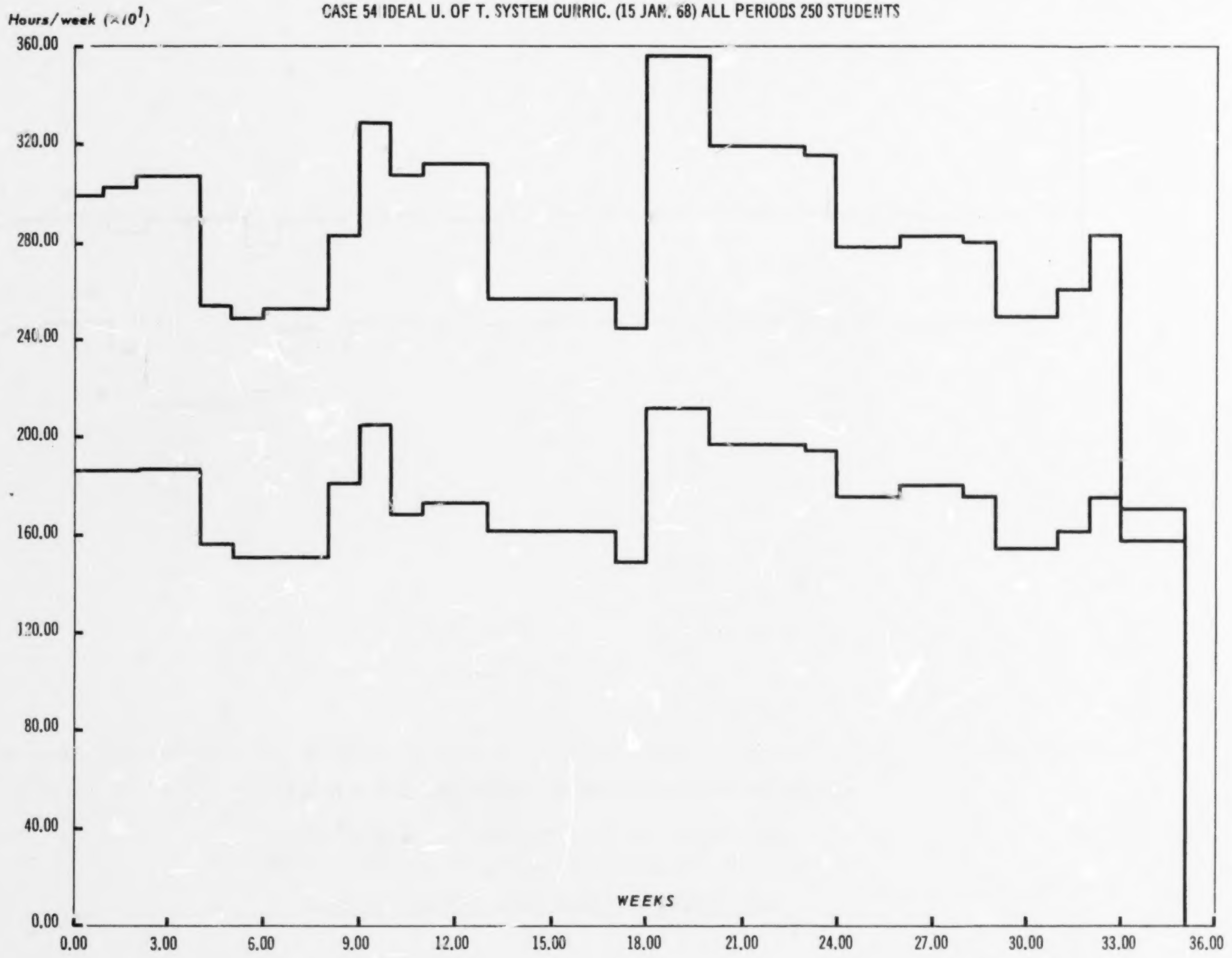


Fig. 7

HEALTH SCIENCES FUNCTIONAL PLANNING UNIT

WK-BY-WK CONTACT HOURS FOR ACAD. STAFF AND ALL STAFF
DEPARTMENT OF ANAESTHESIA IN ALL INSTITUTIONS

CASE 54 IDEAL U. OF T. SYSTEM CURRIC. (15 JAN. 68) ALL PERIODS 250 STUDENTS

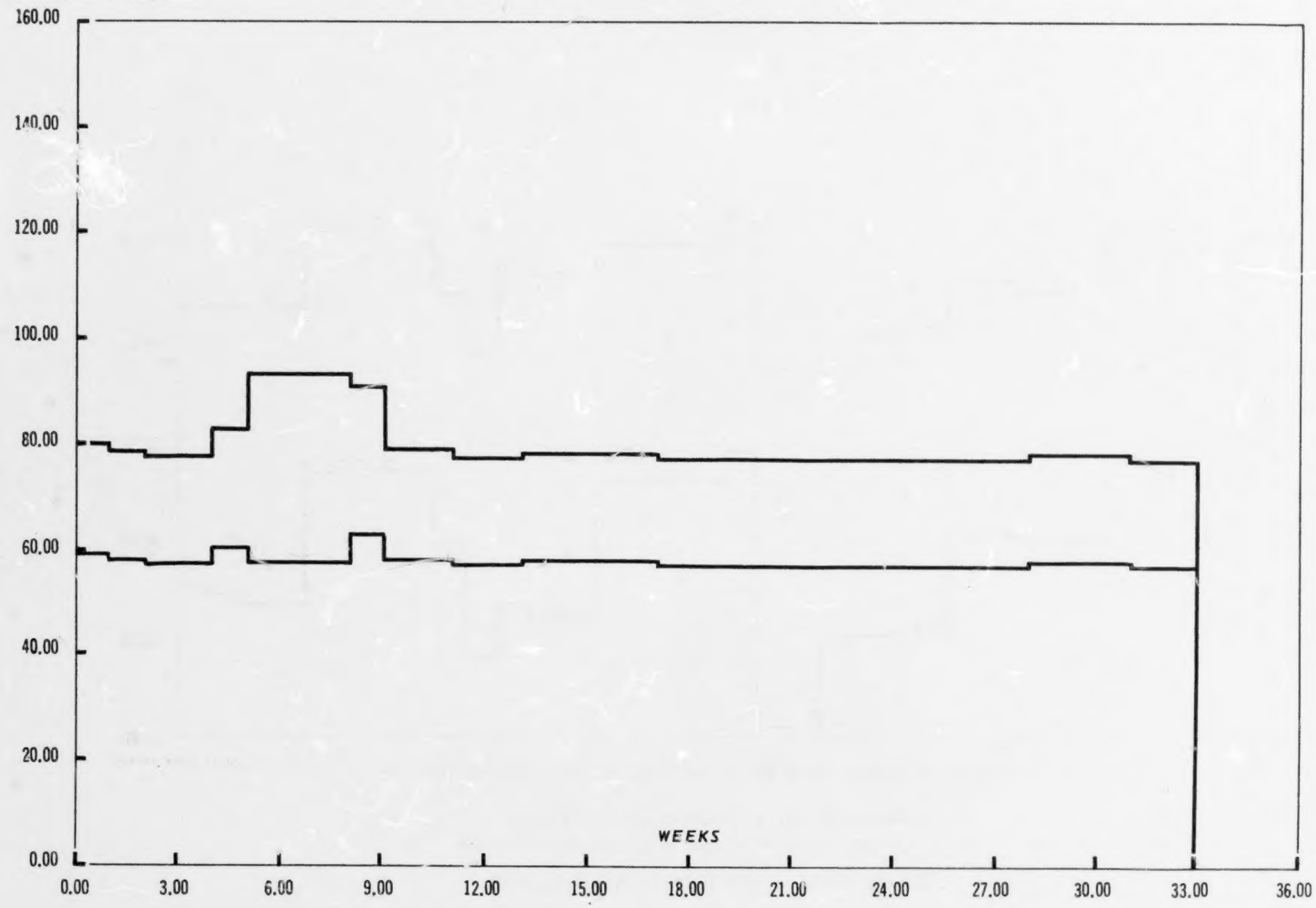


Table 7

Combined Effect on Two Resources of Scale Expansion and Curriculum Change(1)

(Ratio of Proposed to Existing Situation)

	Academic Staff Contact Hours per year (Col. 2, Table 6 over Col. 1, Table 3)	Hospitalised Patient Contact Hours per year (Col. 4, Table 6 over Col. 3, Table 3)
1. Dept. of Medicine	2.96	1.31
2. Dept. of Surgery	3.96	1.34
3. All Clinical departments	2.84	1.55
4. All Basic Science departments	1.29	-
5. Total for entire Faculty of Medicine	2.52	1.55

---

(1) The figures show the ratios of the proposed program (250 students per class, systems curriculum) over the existing situation (175 students per class, departmental curriculum).

Table 8

Impact on Teaching Bed Requirements of Alternative Distributions of Medical Students Among Teaching Hospitals

HOSPITAL

	A		B		C		D		E		F		G		H		All Hospitals Total	
	Students per class	Beds	Students per class	Beds	Students per class	Beds	Students per class	Beds	Students per class	Beds	% of Pediatric Instruction	Beds	Students per class	Beds	Students per class	Beds	Students	Beds
Case 1.	58	404	39	281	39	249	19	107	19	107	-	156	58	464	19	-	1880	
Case 2.	125	879	-	-	-	-	-	-	-	-	-	101	125	1011	-	-	1991	
Case 3.	94	660	62	561	-	-	-	-	-	-	-	132	94	775	-	-	2128	
Case 4.	150	1040	100	677	-	-	-	-	-	-	100	204	-	-	-	-	1921	
Available Teaching Beds, Dec. 1967	-	824	-	622	-	818	-	595	-	343	-	350	-	770	-	278	4600	

3.3.4. Effect of alternative number of teaching hospitals

Medical educational planners at the University of Toronto wish to assess the implications of alternative patterns of participation by the various teaching hospitals. If there are significant economies of scale, costs might be reduced by concentrating clinical teaching in a few hospitals.

Analyses of various alternative configurations are being made. The requirements for academic staff, offices, patients, beds, research facilities and other resources are computed for each department in each teaching hospital. This information is presented to the decision-makers who evaluate the costs and benefits of the alternatives.

Table 8 displays the impact on required teaching beds of alternative distributions of medical students among the teaching hospitals. The results of four hypothetical sets of student distributions are compared with the number of teaching beds available on December 31, 1967. The aggregate number of beds presently available would be sufficient to accommodate any distribution of students. Bottlenecks appear as requirements are disaggregated to the levels of hospitals and departments therein.

3.3.5. Effect of staffing policy on the requirements for staff

Once the total teaching load in terms of contact hours is known, there are many alternative staffing policies that could be used to make this time available. A significant factor in this decision is the amount of time to be devoted to research. Table 9 illustrates the effects of the three following staffing policies.

Policy A - On the average 6 hours of teaching activity will be required per week per staff member.

Policy B - Staff members will be required to teach no more than [illegible] hours per week of lectures or seminars and no more than 4 hours per week of clinics, small group and individual instruction whichever shall be limiting.

Policy C - Each department will require the same average number of teaching hours from its staff members as they provided in 1966-67. These figures were obtained from an analysis of staff activities in the past year.

Table 9 indicates that retention of the present staffing profile (Policy C) would, by 1972/73, necessitate significant increases above the levels forecasted by departmental chairmen in their 1970/71 budget proposals. The department of Obstetrics and Gynecology is an exception; here the needs appear to decline by about one quarter.

Table 9

Comparisons of Full-Time Equivalent (FTE)
Academic Staff Requirements for Selected Clinical Departments(1)

	FTE Acad. Staff	FTE Acad. Staff from 1972/73 Simulated Contact Hours		
Department	1970-71 Budget Forecast	Policy A	Policy B	Policy C(2)
Medicine	237.5	151.9	189.1	314.2
Surgery	167.0	138.1	195.5	207.1
Psychiatry	85.0	60.2	65.1	190.1
Obs. & Gyn.	40.0	24.6	27.1	30.1

(1) New curriculum, seven teaching hospitals, 250 students per class.

(2) The average weekly number of contact hours with medical undergraduates in 1966/67 per FTE academic staff member was for Medicine - 2.9 hrs., Surgery - 4.0 hrs., Psychiatry - 1.9 hrs., and Obs.and Gyn. - 4.9 hrs.

Staffing policy embraces an extremely crucial set of decision variables. Sensitivity analysis carried out with the JCL3W model indicates that the staff activity profile carries profound implications for staff and indirect resource requirements. We are now conducting experiments to illuminate the impact of alternative policies concerning:

(1) Direct contact hours in undergraduate clinical teaching and specialist training per staff member.

(2) Extent and type of research activity.

(3) Extent and type of clinical practice.

Great variation is expected in system requirements as a result of alternative sets of values given to these factors.

3.3.6. Other sensitivity analysis - increasing class size on the average 20-25% for all activities

There are many decision variables of less apparent importance than size of student body, curriculum content, number of teaching hospitals, and staffing policy. These variables can still have significant effects on both the size and composition of resource requirements. The simulation model provides a means of assessing the sensitivity of particular analyses to changes in these secondary variables.

As an example of this type of analysis we show in Table 10 the impact on academic staff contact hours of increasing the average class size by 20-25%. The seven hospital, systems curriculum, 250 student, Period II case is used as the basis for comparison.

Judgements about the effect of such changes on pedagogical effectiveness are left to department heads, curriculum planners and other medical experts.

Table 10

Effect of Increasing Group Sizes

Impact on Academic Staff Contact Hours with Period II Students over Academic Year

	Period II Academic Staff Contact Hours with		
	Group Sizes as Proposed in New Curriculum	Group Size 20-25% Larger than in New Curriculum(1)	% Decrease in Period II Contact Hours with Larger Groups
	Academic Staff	Fac. Staff	Fac. Staff
Medicine (incl. Fam. Med)	10707	8929	18.0
Ophthalmology	53	35	51.4
Surgery	5000	4531	9.4
All Clinical departments	25139	21611	14.0
All Basic Science departments	3502	3135	10.5
Total for Faculty	28641	24746	13.6

(1) The change increased small group sizes to the next integer value, e.g., groups of 4 went to 5 and groups of 5 went to 6.

4. PROBLEMS OF ACCOMPLISHING and IMPLEMENTING SYSTEMS ANALYSIS IN UNIVERSITIES

Central to the entire experiment of using systems analysis to aid university planning and management at the University of Toronto is the notion that better information in the hands of decision-makers means better decisions. If, for any reason, good analysis cannot be accomplished or if analytical work is resisted by decision-makers, the effort is expended in vain. In this section we discuss some problems of accomplishing and implementing systems analysis.

4.1. Problems of Accomplishment

Good systems analysis is not easily accomplished. Several factors seem to us to be critical.

4.1.1. Relevance in problem definition

There is often a tendency for analysts with sophisticated analytical tools to wander about in search of problems to fit the tools. This procedure often produces interesting journal articles but seldom anything else of value. University systems, like many other real systems, are sufficiently complex to require a substantial investment of hard work and humility before the analyst is able to ask the right questions. The work of the Health Sciences Functional Planning Unit has greatly benefited from the fact that its director is a doctor of medicine.

4.1.2. Availability and accuracy of input information

Systems analysis is a kind of information processing. Information is needed to build models, to estimate their parameters and to unambiguously specify alternatives for evaluation.

Some of this information is of a historical nature and may be available in various files kept within the University. It has been our unhappy fate to learn that basic files on staff, students and space are in a very primitive state in many universities. Much work remains to be done in designing and implementing integrated file processing systems in universities. The payoff from this work will be in better, more accurate, more timely and more relevant information for operational decision-making and for planning models.

A second kind of information necessary for systems analysis is that which specifies alternatives being considered by decision-makers. To properly describe and analyse these alternatives it is necessary to assign numeric values to many variables. In traditional academic planning, little heed is paid to the detailed aspects of alternative proposals. There are times when this is appropriate; there are other times when results depend upon apparently minor details. An advantage of model-building and sensitivity analysis is that important details may be spotlighted. The problem then becomes one of inducing decision-makers to think systematically about these important details.

4.1.3. Composition of systems analysis teams

Important benefits can be derived from interaction among analysts with diverse academic training and experience. Dominance by persons trained in a single discipline can constrict the field of vision and reduce the effectiveness of results. Fruitful combinations can be made of economists, operations researchers, applied mathematicians, engineers and computer scientists. Specialists in business or public administration and organisation theory could also make a valuable contribution.

4.2. Problems of Implementation

Few university administrators are accustomed to using the type and volume of information that can be provided by a good systems analysis group. Certain changes in managerial style and thinking are necessary before this information can be used to best advantage. The following is a discussion of a few necessary but not necessarily sufficient criteria for the usual application of systems analysis.

4.2.1. Receptivity

The most important aspect of a manager, from a systems analyst's point of view, is receptivity to a formal, systematic approach to decision-making. Such an approach forces administrators to lay bare the basic assumptions upon which their plans are based. Clear statements of objectives and unambiguous decisions are the primary components of systems analysis. They are the factors that are analysed for their impact. An administrator who is reluctant to be open about his planning ideas or to explore alternatives before the group is unlikely to be able to take advantage of the techniques. Receptivity then is not just an attitude towards using new methods but also a desire to explore openly the implications of alternatives.

4.2.2. Organisational placement

Given a receptive administrator it is important that the team report organisationally to the person responsible for making final decisions. In some cases it may be the Dean of the faculty, in others a vice-president of the university. Analysis of the kind we have been discussing is concerned with the problems of senior administrators. To bury such analysis under a number of organisational layers inhibits a rapid two-way flow of information and isolates the analysts from the problem sources. Situations change rapidly, constraints appear and disappear, new considerations come to light; in brief, any analytic activity that is going to deal with real problems must be first-hand "where the action is". If it is able to present analyses of alternatives and gain knowledge of possible new alternatives to be studied, the group can be most effective.

4.2.3. Interaction with planners

To say that the analytical team must be finally responsible to the top administrator does not mean that the group should be aloof from those involved in the detailed planning effort. On the contrary, we believe that close interaction with those people is a necessity. The process by which information is being exchanged between the Health Sciences Functional Planning Unit and the curriculum designers in the Faculty of Medicine is an example of the kind of interaction most likely to produce good results.

4.2.4. User confidence

Useful analysis and used analysis are often far apart. While many of the foregoing steps will help to insure that analysis is used, it is necessary to dispel from the mind of all those involved in the planning process, the black box image of the simulation model. People's confidence in using these new tools can be heightened greatly by increasing their understanding of how the computer simulation model uses the information that is fed into it. A carefully planned introductory session discussing what it is and how it is used can be most helpful.

FOOTNOTES

[1] E.S. Quade; *Military Systems Analysis*, RAND Corporation, RM-3452-PR, January, 1963, p. 2.

[2] R.N. McKean; *Government Efficiency Through Systems Analysis*, Wiley, 1958.

[3] Included are the faculties of Medicine, Dentistry, Pharmacy, and Food Sciences, the schools of Nursing, Hygiene, and Physical and Health Education, and the Banting and Best Department of Medical Research.

[4] The departments are Anaesthesia, Bacteriology, Biochemistry, Institute of Bio-Medical Electronics, Medical Biophysics, Medicine, Obstetrics and Gynecology, Opthalmology, Oto-Laryngology, Paediatrics, Pathological Chemistry, Pathology, Pharmacology, Physiology, Preventive Medicine, Psychiatry, Division of Rehabilitation Medicine, Surgery, Therapeutics, Art as Applied to Medicine. See Faculty of Medicine Calendar for 1967/68.

[5] The eleven institutions are Toronto General Hospital, Toronto Western Hospital, St. Michael's Hospital, Wellesley Hospital, Princess Margaret Hospital, New Mount Sinai Hospital, Sunnybrook Hospital, The Hospital for Sick Children, The Clark Institute of Psychiatry, Women's College Hospital, and Lyndhurst Lodge Hospital. Each of these hospitals, except for Sunnybrook, is governed by its own board of trustees. Sunnybrook, formerly a veterans' hospital, was presented to the University of Toronto on October 1, 1966.

[6] The Toronto General, New Mount Sinai, Sick Children, and Women's College hospitals are within two blocks of the corner of College St. and Avenue Road, i.e., in immediate proximity to the medical science building on the main campus. The Clark Institute is five blocks from the intersection. Toronto Western, St. Michael's, Wellesley, and Princess Margaret hospitals are within one and one-half miles of the campus. Lyndhurst is about two and one-half miles from the campus and Sunnybrook is about six and one-half miles distant.

[7] For example, clinical service to patients is considered by the hospital boards of trustees and the clinical staff to be a main, if not the sole, output of the system. But the University's Board of Governers' Special Committee on the Future Development of the Faculty of Medicine mentioned as objectives only education and research, i.e., service was excluded. Presumably, then, patient care was considered by the Special Committee to be an input to or a by-product of the education and research processes. See the *Report of the* Board of Governors' Special Committee on the Future Development of the Faculty of Medicine, May 1964 (mimeograph).

[8] Ibid., P. 11.

[9] Ibid., Pp. 27-28.

[10] Ibid.

[11] Ibid., P. 28.

[12] "A Proposed Plan for an Undergraduate Medical Curriculum", Recommendation of the Curriculum Committee, January 3, 1967.

[13] Approximately 700 members of the Faculty of Medicine hold University appointments. Of these only about 200 hold full-time appointments and nearly all of these are members of the basic science departments; the number of full-time members of clinical departments is very small. This information is supplied by the Academic Service Unit.

[14] See the Report of the Special Committee of the Board of Governors, op. cit., pp. 17-20.

[15] The first of the models (the CAMPUS model) developed at the University of Toronto was described in R.W. Judy and J.B. Levine, A New Tool for Educational Administrators, University of Toronto Press, 1965. This model is now being implemented and tested by the University's Office of Institutional Research. The model described in this paper is an extension of the CAMPUS model to a very disaggregative level.

[16] It is called the JCL3W Model because it was designed by R.W. Judy, S. Centner, J.B. Levine, R. Wilson, J. Walter, and W. Wolfson. For a more technical description of this Model, see S. Centner and W. Wolfson; "Simulation and Rational Resource Allocation in the Health Science Faculties", a paper presented at the meeting of the Institute of Electrical and Electronics Engineers Conference, March 22nd, 1967, New York, N.Y.

[17] A special report generator was written for the JCL3W Model and other models under development at the H.S.F.P.U. See C.A. Burgess; A Report Generator Program, Unpublished M.A. thesis, Department of Computer Science, University of Toronto, October, 1967.

[18] A class size of 225 is assumed for the first year medical because it is planned to accept about 25 more students in second year who transfer in from science programs outside the Faculty of Medicine.

APPLICATION DE L'ANALYSE DES SYSTÈMES A L'APPRÉCIATION DE DIFFÉRENTS PROJETS DE FACULTÉ

par Richard Judy, Jack B. Levine,
Richard Wilson et John Walter (Résumé)

Cette étude a deux objectifs principaux :

(1) montrer comment l'analyse des systèmes peut aider la planification au niveau de l'université au moyen d'une étude d'un cas se rapportant à un problème de planification d'une université spécifique, et

(2) indiquer quelques-uns des problèmes rencontrés en menant une telle analyse et en mettant en oeuvre ses résultats.

Chaque système a des variables (inputs et outputs) et une technologie qui permet de transformer les inputs en outputs. Nous nous efforçons de déceler les principales interdépendances qui unissent les variables importantes par la construction de modèles du système.

La technologie d'un système étant donnée, nous pouvons modifier les outputs et enregistrer les conséquences pour les inputs requis. Ceci peut être réalisés par de nombreuses combinaisons d'output ; cela fait, nous aurons exploré les conséquences sur les inputs pour les séries correspondantes d'outputs possibles.

D'autre part, nous pouvons conserver la technologie sans modification, mais modifier les inputs du système et observer les changements d'outputs qui en résultent. Enfin, il est possible de faire des expériences sur la base de variantes de technologie en modifiant certaines caractéristiques du système.

La valeur de ce type d'analyse input-output réside en ce qu'elle permet aux centres de décision de se poser des questions du type : "Que se passe-t-il si ... ?". Lorsqu'ils font face à un problème, les centres de décision peuvent explorer les conséquences de nombreuses variantes de décision possibles.

L'analyse des systèmes décrite dans cette étude est actuellement conduite à l'université de Toronto pour permettre la planification des activités des facultés des sciences médicales. La plupart du travail à ce jour ayant été consacré à la Faculté de médecine, l'essentiel de cette étude traite de cette Faculté. La Faculté de médecine comprend 19 départements. Onze hôpitaux, où l'enseignement clinique est donné, sont associés à la Faculté de médecine. La formation au niveau du diplôme et la recherche y sont également menées.

Nous avons décidé de traiter les facultés de sciences médicales, ainsi que toutes leurs facultés, leurs départements, et les hôpitaux associés comme constituant un système. Il s'agit d'un système complexe à inputs ou outputs multiples.

Un des objectifs principaux de l'Université est la formation du personnel médical scientifique. Les outputs de l'enseignement peuvent être regroupés sous quatre rubriques :

(1) Enseignement pré-universitaire pour les étudiants de la Faculté de médecine et des autres facultés ;

(2) Enseignement au niveau du diplôme dans le domaine des sciences fondamentales ;

(3) Formation de spécialistes cliniques ; et

(4) Continuation de l'enseignement médical.

Tout un ensemble d'inputs sont intégrés dans ce système. Ce qui semble être des inputs aux yeux de certains peut sembler être des outputs pour d'autres ; par exemple, les soins aux malades apparaissent à l'Université comme constituant un input pour les processus d'enseignement et de recherche, alors que le traitement du malade apparaîtra comme un output important des hôpitaux associés.

Toutes sortes d'équipement et de moyens divers sont intégrés dans le système. Les amphithéatres, les salles de séminaires, les laboratoires, les bureaux, les quartiers résidentiels et les cobayes sont quelques-uns d'entre eux.

Les responsables du système des sciences médicales de l'Université de Toronto font maintenant face à tout un ensemble de problèmes fondamentaux.

Parmi ces problèmes on citera l'expansion envisagée du programme médical pré-universitaire qui portera le nombre des étudiants de 175 à 250 dans la classe d'entrée. Un autre problème a trait à la restructuration recommandée du programme d'études médicales pré-universitaires.

Au début de 1967, on a établi un service de planification fonctionnelle des sciences médicales avec l'aide financière du Gouvernement de l'Ontario. Un des objectifs principaux de ce service est de mettre au point des modèles qui permettront d'évaluer quantitativement les conséquences de variantes de plans et de programmes sur les ressources. La section suivante décrit un des modèles qui sont maintenant opérationnels.

Le Modèle JCL3W

Le modèle peut prendre en compte des descriptions technologiques du système (ou des éléments primaires qui le composent) et les niveaux d'output ; il procède alors au calcul des quantités d'input "requises" pour produire les outputs.

Une partie des obligations imposées à un département découle de la fonction d'enseignement. Ceci est traité en décomposant chaque programme d'étude en éléments de base que l'on appellera des "activités", de telle sorte que certains besoins d'inputs directs puissent être associés à une "unité" de cette activité. Parmi ces besoins, on citera : le personnel de l'Université, les amphithéatres, les salles de séminaires, les malades, etc. Les besoins en ressources induites sont dûs à la nécessité de faire fonctionner et d'entretenir le système de l'université. Parmi ces besoins induits, les besoins administratifs sont relativement évidents. Les besoins en ressources autonomes se réfèrent aux ressources nécessaires, qu'une fonction d'enseignement soit réalisé ou ne le soit pas. Le soin des malades est un objectif autonome.

Le bloc de base pour la construction du modèle JCL3W est "l'activité". Une activité est une unité (en général une heure) d'une activité au sens littéral du terme (par exemple : cours de pathologie, séminaire de chirurgie) qui met en jeu un groupe d'étudiants et une série de ressources d'input. Toutes les activités universitaires qui mettent en jeu les étudiants en sciences médicales sont décrites suivant leur type, la dimension du groupe d'étudiants mis en jeu et les spécifications d'input nécessaires pour accomplir le niveau unitaire de l'activité.

Les étudiants traversent le système dans ses phases successives. Quelques-uns le quittent, d'autres l'abandonnent et reviennent, d'autres le parcourent directement jusqu'au diplôme.

Les inputs de la Faculté de médecine qui sont en voie d'être calculés directement par les programmes de simulation sont les suivants :

(1) Personnel (personnel de la Faculté de médecine, personnel résident, démonstrateurs, autre personnel non-universitaire) ;

(2) Malades et fournitures (malades des salles d'urgence, malades hospitalisés, sujets soumis à autopsie, spécimens biologiques, spécimens neurologiques, enfants nouveaux-nés) ;

(3) Espaces (amphithéatres, laboratoires d'enseignement, espaces consacrés à une recherche particulière, salles en rond pour les conférences).

Le Service de planification fonctionnelle des sciences médicales travaille en étroite relation avec les comités des programmes d'étude pour évaluer les besoins en ressources qu'entraînent les diverses propositions qui sont à l'étude pour le nouveau programme, l'expansion des inscriptions et le rôle qui incombera à l'hôpital dans cette expansion. On trouvera ci-dessous quelques exemples de la façon dont le modèle JCL3W est utilisé pour évaluer l'impact des changements envisagés.

Effets d'échelle

Tous les autres facteurs restent sans modification (programme d'études, répartition des étudiants parmi les hôpitaux d'enseignement, etc.) mais l'effectif universitaire passe de 175 à 250 étudiants par classe. Le nombre total des heures de contact du personnel universitaire augmentera de 40 %, dont 20 % seulement dans les départements des sciences fondamentales. Ceci reflète le fait que de nombreux cours dans ces départements se font sous forme de conférences et que la taille du groupe qui y assiste peut être modifiée.

Effets d'un changement de programme

Au cours de la seconde moitié de 1967, un nouveau programme d'études détaillé a été mis au point par les divers comités. Les conséquences des modifications du programme sur le personnel universitaire et les malades hospitalisés ont été calculées. Pour l'ensemble de la Faculté, les changements nécessiteraient une augmentation d'environ 85 % des heures de contact du personnel universitaire. Les besoins totaux en malades hospitalisés augmenteraient d'environ 10 %.

D'autres études en cours portent sur les effets combinés des augmentations d'échelle et du changement du programme d'études, l'impact de diverses variantes quant au nombre des hôpitaux d'enseignement, et les effets des politiques en matière de personnel sur les besoins en personnel.

PROGRAMME BUDGETING IN SWEDEN

by H. C.-F. Hammar

I thought a short account of the present situation in Sweden might be of interest at this stage of the discussion, and I will take as a starting point the country report of Sweden which was issued by the O.E.C.D. last year. In this report, the reader may discover, between the lines as well as on the lines, our disappointment about not being able to present the appropriate expenditures for functions and activities. The Swedish budget system has up to now been an old-fashioned one, but now various improvements are being considered.

An experts' Committee has been dealing with a programme budgeting system for the entire Swedish administration. They presented a report in 1967 which proposed a complete system for budgeting, management, and account control. It involves both a one year system and a medium term system covering four years. A great emphasis is put on the measurement of outputs (performance) and on the decentralization of responsibilities down in the organization to the chiefs who can actually influence the efficient use of resources.

However, voices of warning have been raised saying that the system may be a splendid one technically, but that it will not constitute a planning tool. The Committee proposal starts from the point where the programmes have been fixed, but at least on the governmental level there must be analysis and setting of relevant goals and that is true even if we do not enter into the political long term aspects. It is important to take the opportunity to get a proper tool for planning and not only consider budgeting and implementation purposes.

The Committee's budget system does not only display expenditures in the form of grants to authorities as in the present budget, but also contains what we call complementary costs. The budget table will, in principle, have two columns:

(1) expenditure
(2) total cost

the difference (2) - (1) being the complementary costs not actually paid out by the agencies such as costs for pensions, fees to social security, office units and estimated depreciation costs for investments made from capital investment programmes not included in the operational programmes. Such costs are now not paid out by the agency in question.

The Swedish Ministry of Finance is now taking two steps:

(1) a general budget reconstruction for all authorities as a preparation for programme budgeting;
(2) an introduction of programme budgeting, in the Committee's sense of the term, for a small selected group of agencies: in principle one agency in each ministerial area.

The budget reconstruction step has not yet been made official but it is meant to be implemented for the fiscal year 1969/70[1]. This means that this year's preparatory budget work in agencies and ministries will be affected. The first step means that there will be a common grant for salaries and other expenditures instead of the present system with two separate grants and a possibility is opened for choice between different types of resources, that is between manpower and equipment, etc. There will, however, be some special regulations connected to it so I think that the freedom of choice in some cases may be somewhat limited. To this new form of grant pensions and payments for social security will be added in the form of a certain percentage of the salary part of the grant. This percentage should correspond to the future cost of pensions, etc. for the existing employees.

The new grant also includes rental costs for offices etc. and this item as well as pension expenditures will be distributed to the budgets of the agencies. Up to now this has been paid from collective grants. There is supposed to be some kind of transaction with those social and rental costs in the agencies, the cost thereby ceasing to be complementary costs in the sense used at the Committee.

As I mentioned earlier the Ministry of Finance is now also taking a second step towards programme budgeting involving analysis and establishment of programmes for one or two agencies within each Ministry. Preparations will be made for an official programme budget for these agencies for the fiscal year 1970/71. There may in some cases be shadow budgets in programme terms prepared already this autumn for 1969/70.

Within the Ministry of Education the starting area chosen for programme budgeting is "Higher Education and Research". This is the name of the category but it is not at all certain if we can include research in the beginning. There are several reasons why the school system was not chosen:

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[1] The instructions were published shortly after the O.E.C.D. meeting.

(1) The primary and secondary school budgets are already somewhat programme oriented.
(2) The local school authorities are non-governmental and technical problems would therefore be encountered which are of no interest for PB as such.
(3) They are since some time ago the objects for negotiations concerning a new grant system. This will to a certain extent permit savings on teachers' salaries, for example, obtained by replacing teachers by teaching aids etc., to be used by the local authorities. At present the State pays for the teachers' salaries while the local authorities pay most of the equipment and maintenance costs. In Sweden as elsewhere, it has been observed that this system provides no incentive for the local authorities to economize. We are now investigating how much on the saving on salaries the local authorities should be allowed to spend on something else. This specific programme budget idea is thus already being studied for the school system.

Some comments on the organization of Higher Education and Research in Sweden: In principle, the faculties can roughly be divided into two kinds: 1) faculties of philosophy and others with no restrictions to the number of entrants and up to now with a rather free system of studies, 2) specialized faculties with restricted entry and strictly organized studies. Grants are from last year given to each general faculty, a general faculty being in common for the whole country. Formerly, grants were given geographically to each university.

The programme budget study in Higher Education started a month ago. Three expert groups have been appointed:

(1) a directing group in the Ministry of Education including also members from the Ministry of Finance;
(2) a special group in the Central Agency for Higher Education;
(3) a special group for "Higher Agricultural Education" which has already been selected to be one of the pilot units for PB application.

We have now started along three main lines:

(1) Analysis or rather survey of - especially the "free" - faculties' problems and the flow through the system. How to measure the input and output and what criteria should be used for measuring the quality of the output? (There are no general central criteria for university grades in Sweden. A grade in a subject in one University may not always correspond to the same grade for this subject in another University.) How to distribute resources in an appropriate way? There are also several other factors in the system to be studies, a.o. the stock of administrative regulations.

(2) Another main line is to successively introduce smaller general changes in the budget technique such as combining the grant for salaries with the grant for equipment and maintenance.

(3) A third aim is to establish rather soon, after a special study, a more or less complete programme budget system at some pilot institutions.

We think the first main line, the general analysis of structure and planning problems, is very important as planning and technical budget aspects must be clearly connected.

There are, however, a number of problems that arise immediately. Should there be separate programmes for research or should it be included in other programmes? Research is financed in various ways. We have for instance research paid by central research committees or by private funds, or on contract basis. But a large part of the research is very strongly connected with teaching. It is difficult to identify the costs for this kind of research as the same resources are used for both purposes.

We have the problem of programme definitions, that is, should they be divided by faculty or subject or study level? Should the "major programme" named Higher Education and Research first be divided in research and teaching and then each of these in programmes and subprogrammes? Programmes could correspond to a somewhat more specified number of objectives each with a governmental grant. Then one could have subprogrammes divided in a way suitable for administrative and teaching purposes. In this respect the importance of not taking the present organization for granted has been underlined. You must analyze whether or not it should be changed.

Another point is the question of how to build in incentives for economizing and rationalizing. Here, there is the problem of changing the present administrative rules so that the proper decision-making power is given to the proper level in a way that someone can have the budget responsibility for the programme. At present you should not be surprised to find that the staff is hired on one level while on another not subordinated or coordinated level they buy the equipment etc.

I would like to conclude with a personal point of view. I think this kind of reform will take a very long time to introduce as it requires specially trained people and a somewhat new kind of thinking among all staff members. Ordinary accountants cannot very well be used and a general knowledge about programme budgeting must be spread in the organization. Perhaps various types of specialists will be needed as advisors.

PROGRAMME BUDGETING IN CANADA

by R.H. Marshall

I had not intended to say very much on the subject of programme budgeting, but some of the questions raised here during the meeting on the practical aspects of the question are, I find, interesting, and perhaps a brief run-down of the Canadian experience might be useful.

I will not go back very far in history, but in the year 1962, there was a Royal Commission undertaken in Canada, called the Glassco Commission, which was established to look into the efficiency of government administration. The findings of this Royal Commission were among other things that financial management, including the way that money was budgeted in the federal government, could do with a good deal of improving. It therefore feil to the Treasury Board, which is roughly comparable to the U.S. Bureau of the Budget, to take this recommendation in hand, and try to implement these recommendations, if they proved practicable. The first step was to have a look at the estimates as they were presented. At this time we were working on a vote and standard object basis, and this was the kind of estimates presentation which the Royal Commission had said were rather impractical documents. It is necessary to understand that the way the estimates were presented to the House of Commons was very skeletal. There was very little information supplied to Members of Parliament in this type of estimates, and thus it gave them little opportunity to deal with the subject material in depth.

The Treasury Board undertook to look at the traditional vote structure of the estimates to see if this could be converted at least roughly into a programme structure for all departments. There was a consolidation of votes and programmes were cast. I do not wish to imply that these will be the end product programmes, but they were used as a starting point. The Treasury Board then undertook to hire half a dozen groups of management consultants and sent these out to individual departments on a test basis to see if the recommendations of the Royal Commission on financial management were in fact practical for the workings of these departments and the government as a whole. This took roughly eight months. The various consultants reported back, each recommending somewhat different ways that the new concept of financial management might be implemented, but all agreeing that the principles were sound and that the government should undertake the process. One of the next steps, then, and I am speaking now of the year 1964, was that several of the larger departments of government were started on the road of programme budgeting. I should explain that as we use the term programme budget in Canada, it is a two part process, although these are closely linked. We did not feel that only one document presented as a formal budget late in the year was what we wanted to accomplish. As a result of this we evolved what we call the programme review, which is an ongoing process. The Program Review, a five year forecast of plans and resource needs, is put before the Cabinet in May. (Our fiscal year is from April 1 to April 1 next year.) This document is the result of a good deal of planning analysis, goal setting, trade-offs and so on within the department. I would say for an average department it consists of probably a couple of hundred pages of explanation. Programme analysts in the Treasury Board go over these documents during the summer of the year, and make recommendations on departmental financial targets to Cabinet.

Once approved by Cabinet these targets are then passed to Government departments and form the basis for the actual estimates in the form of programme budgets, which are presented sometime in November of the same year. The targets are more or less absolute, in other words if there are deviations upward, let us not say downward, these have to be very well justified, in order to get clearance. Now one of the difficult things is, of course, to convince any group of ministers that they should give any extended commitment at all, much less a five year commitment to departmental plans, so this education process is going on. At the moment, as I have said, the targets set by the Cabinet are for one year, but we are trying to emphasize the importance of allowing departments to plan ahead, and hope ultimately to have approval in principle for five year plans. Now, I will become a little more particular and get to my own department, which is the Department of Manpower and Immigration.

It really rested with the departments, once the theory of programme budgeting was approved to get on with the job. We in my department undertook last year as an evolutionary state in the programme review to do some cost-benefit analysis on one programme, and we commissioned a group of consultants to give us a hand on this. They produced a document entitled "Analysis of the Occupational Training for Adults Activity - The Department of Manpower and Immigration in a Planning, Programming Budgeting System Context". We received this in October of 1967. We are still analysing it and evaluating its implications and we will have summaries ready in a short time. That little job incidently cost $100,000 to produce, and in the view of some people, if economy is going to cost this much we are not able to afford it, but I do not think that these persons are in the majority. We did one programme and thus learned a good deal from the consultants, trained some people ourselves, and we are now undertaking other areas of cost-benefit analysis within the department. We are currently working on our Manpower Mobility Programme. I think any of us who have had any experience with programme budgeting, and in particular cost-benefit analysis, will realize that one of the first road blocks to the process is the lack of precise information. You think you know everything you are doing in a programme until you have to break it down for analysis. The experience that we had in this regard lead us to set up a task force to go to work immediately on structuring an information system that will produce the kind of information we need to do effective cost-benefit analysis and long term planning. This is a very long and detailed job indeed and will probably take several years to finish. Our next step will be to move into the full PPBS concept.

I might explain now, that the programme review and budget process in federal government circles in Canada fell by default to the financial officers in the departments to structure. I personally feel that this was a mistake but planners had not traditionally dealt with budgets. In my own department we did things differently, we have a quite separate unit that does the forward planning and economic work and rough cost analysis, we then leave it to the financial officers to do the detailed arithmetic, after plans have been cast. Since this is not the case in the majority of Canadian government departments there is already a tendency to swing back towards traditional detailed dollars and cents estimates kind of forecasting to the detriment of detailed analysis and presentation of the programmes themselves during the programme review.

The Treasury Board has produced a manual to assist departments in the process called the "Estimates Manual". I plan to leave one of the manuals with the O.E.C.D. in the library in the hope it would be of some use to the staff and to the delegates. It is also being translated into French and will be available shortly should anyone want it. I have brought along also a few copies of an extract from the Monetary Times of Canada. This article is entitled "Better Value for Tax Dollars". I have brought sufficient copies so that I think each delegate could get a copy if he wishes. It gives a very good run-down of what is going on in Canada as regards the programme review and the PPBS outlook.

I would like to mention the evolution from the old system into the new budget system. We are currently still supplying to the House of Commons estimates on the old basis. We began to cast them on the new programme basis last year in pamphlet form for a few departments. The purpose of this was to put them before the Public Accounts Committee of the House, and any of the House Committees that were dealing with these departments in order that they could look at the new system and see how it worked out. This year for the first time, the estimates of about twelve departments will be completely cast in the programme budget way, and be put before the House Committees even though we are printing estimates in the traditional way as well. I would hope within two years that the entire presentation of estimates for Canada will be done on a programme basis and be put before the House in that manner.

I would also like to comment on the discussion about the relationship between the term programme budget and the planning aspect. I can say that I spent on and off a year and a half trying to establish the goals for one department clearly and to sell these to the departmental administrations so that they recognized them and believed they were the goals of the department. Now this was not an easy job, but it is the fundamental job it seems to me on which planning has to be based. I should mention, too, that in a departmental context, part of the programme review is dealt with in my department through a process of raising issues at a particular time of the year. These issues may involve anything that should be raised, either from the point of view of a policy problem or a new programme or any of the ideas that are being thought about or it is considered should be thought about. Such issues are raised in the fall prior to the formal spring presentation of the Program Review to the Treasury Board, for discussion briefly by the Senior Management Committee of the department and are then given to a group of experts to prepare position papers on. For example, immigration - Should we have increased immigration? Are we handling the process in the right way? etc. These issues are dealt with in great detail. We produced this year, four or five hundred pages, I suppose, of issue papers or policy papers which are brought back to the Senior Management Committee of the department, and discussed over a period of several days. Positions are then taken. It is on this platform of policy decisions and orders of magnitude and direction which programmes should take that the programme review document is drawn up and on which targets are ultimately based. The programme budget is nothing wonderful in itself, it is a casting of arithmetic at a later date on a programme basis. The programme review is the fundamental part of the procedure from the standpoint of planning.

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